



DEPARTMENT OF

Soil, Water, and Climate

SUMMER 2004 - VOLUME 1, ISSUE 1

Precision Ag Conference draws experts from all over the country and world

More than 550 agriculture practitioners and academics attended this year's Seventh International Conference on Precision Agriculture from July 25-28 in downtown Minneapolis.

The international conference, held every two years, provides a forum for discussion and presentations on the state of precision agriculture – the practice of using remote sensing, soil sampling and information management tools to optimize agricultural production.

The Center for Precision Agriculture at the University of Minnesota hosted agricultural producers, academics and equipment manufacturers from 30 countries as they converged to share new technologies and field-management techniques.

The conference featured significant research and applications in precision agriculture and also exhibited the latest tech-driven tools in precision agriculture.

Conference presentations included how to use remote sensing technology to map crop diseases, improving agricultural operational efficiency with wireless communication and performance of new non-invasive sensors for on-the-go variable-rate fertilizer application.

The international conference also featured the latest technologies in remote sensing, personal digital assistants (PDA's) and auto-steer systems. Major exhibitors included John Deere, Ag Management So-



lutions, Omnistar, Inc., Midwest Technologies and many more.

"The agricultural practitioner attending this conference learned about the latest technologies, software packages, nutrient management tools and remote sensing approaches to produce crops more efficiently while improving profitability and protecting

- ▶ See **CONFERENCE** Page 6
Commemorative session honored Pierre Robert, founder and former director for the Precision Agriculture Center

Featured Faculty

Philosophy of fun

Professor Jay Bell builds student-learning communities to foster learning

Nearly 28 years ago, Professor Jay Bell was inspired to study soil science by a professor named Wybe Kroontje, meaning "little crown" in Dutch. Now, Bell has continued this tradition by inspiring many of his own students, which his

two Distinguished Teaching Awards attest to. It is clear that teaching students is Bell's passion.

Bell started off as an engineering major

- ▶ See **BELL** Page 4
Students travel to Duluth and North Dakota



What's Inside

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Message from the Department Head



Greetings and welcome to our first issue of the Department's newsletter! We hope this newsletter will be a great way to connect with our alumni and friends and to keep you up to date on our research, outreach, service and much, much more. We will feature at least one faculty member in each issue and also publish stories on interesting research and outreach benefiting residents in Minnesota and beyond. In this issue, for example, you can learn how the efforts of the Department and the Minnesota Climatology Office helped keep a town in northwestern Minnesota high and dry (pg. 7).

We want to make this newsletter useful, informative, and interesting so send your news and events to soilnews@umn.edu. Let us know where you are and what you're up to. And be sure to check out our newly designed Web site at www.soils.umn.edu. It includes a calendar of events, faculty profiles, more department news, and an electronic version of this newsletter. If you know other alumni or friends who

might be interested in receiving this newsletter, please let us know. You can also send them the .pdf version that will be posted on our website. Look for additional features on our Web site.

Congratulations are in order for our award-winning faculty, students, and staff (pg. 3). A large number of departmental members were given highly prestigious awards from the University, the College, and our professional societies. It's an honor to serve such a hard-working group of students, researchers and educators.

Special thanks are in order to Drew Geraets and Jenni Swenson who put this newsletter together. Bravo! We hope you enjoy it and please send us your suggestions and comments for future issues. Have a great summer, and we hope to hear from you soon!

Sincerely,
Ed Nater
Department Head

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About

The Department of Soil, Water, and Climate Newsletter is a quarterly publication that includes events, research, faculty/student profiles and much more.

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This newsletter was prepared by Drew Geraets, the Department of Soil, Water, and Climate's communication intern. Please send feedback, news, and events to: soilnews@umn.edu

Events Calendar

Aug. 18-20	7th Annual Minnesota Rural Summit Hibbing Community College Hibbing, Minn.
Sept. 14	School Year Kick-off North Star Ballroom, St. Paul Student Center 11:30 a.m. - 1 p.m.
Sept. 16	Waseca Open House Southwest Research and Outreach Center Waseca, Minn.
Oct. 5	COAFES Career Day North Star Ballroom, St. Paul Student Center 10 a.m. - 2:30 p.m.
Oct. 8	Council of Soil Science Examiner's National Test (Register by Aug. 27)
Oct. 12	12th Annual Kuehnast Lecture Series 335 Borlaug Hall 3-5 p.m. (see pg. 5 for more details)
Oct. 31- Nov. 4	ASA-CSSA-SSSA International Annual Meetings Seattle, Wash.
Nov. 9	Minnesota AgriGrowth Annual Meeting Thunderbird Hotel and Convention Center Bloomington, Minn.

Awards and Honors

► Send awards and honors news to: soilnews@umn.edu

Honorary Doctoral Degree



Dr. H.H. Cheng, professor emeritus and former head of the Department received an Honorary Doctorate of Laws Degree from the University of Minnesota at the COAFES commencement ceremony on May 9.

The Honorary Doctorate is the highest award conferred by the University of Minnesota to an individual who has achieved acknowledged eminence in cultural affairs, in public service, or in a field of knowledge and scholarship.

Cheng was honored for many great accomplishments in his field, including his work as consultant to the World Bank on soil reclamation projects in China, adviser to a United Nations Development Project regarding water conservation in the Yellow River, and other projects around the world. This is only the 190th Honorary Doctorate given out by the University in its history.**

Fellows

Dr. Deborah Allan (SSSA and ASA) and **Dr. Michael Russelle** (SSSA) were named Fellows.

ASA Fellows and SSSA Fellows are active members of the Society who have been nominated by other active members of the Society. Fellow is the highest recognition bestowed by each Society. Up to 0.3 percent of each Society's Active and Emeritus Members may be elected to Fellow. The nominee will have made outstanding contributions in an area of specialization whether in research, teaching, extension, service, or administration and whether in public, commercial, or private service activities.

Hueg-Harrison Fellowships

Jianmin Zhang (a Ph.D. student in atmospheric sciences working with Dr. Tim Griffis) and **Elena Beyhaut** (a M.S. student in soil biology working with Dr. Peter Graham) were recently awarded Hueg-Harrison Fellowships.

These fellowships are awarded "to recognize the student/mentor relationship

Distinguished McKnight Professorship

Dr. Michael Sadowsky, internationally renowned for his research in several areas of environmental microbiology, was recently named a Distinguished McKnight University Professor.

The purpose of the Professorship is to recognize and reward the University's most outstanding mid-career faculty. Recipients are honored with the title Distinguished McKnight University Professor, which they will hold for as long as they remain at the University of Minnesota.

The grant associated with the Professorship consists of \$100,000 to be expended over five years. The awardees were chosen on the merit of their scholarly achievements and the potential for greater attainment in their field; the extent to which their achievements have brought distinction to the University of Minnesota; the quality of their teaching and advising; and their contributions to the wider community.

Sadowsky has made major contributions to understanding the genomics, genetics, and biochemistry of the microbial degradation of environmental pollutants. He has also made major contributions to symbiotic nitrogen fixation research, the

that evolves during the pursuit of a M.S. or Ph.D. in production (applied) agriculture." The recipients are called Hueg-Harrison Fellows. Each was nominated by their advisor and will receive additional support for their graduate pursuits.

Doctoral Dissertation Fellowships

Kurt Spokas and **Adam Birt** both received Doctoral Dissertation Fellowships from the Graduate School. A very small number of Doctoral Dissertation Fellowships were awarded this year due to the large number of Graduate School Fellowships for incoming students - both Fellowships come out of the same pool. Consequently, this is a particularly high honor this year.

COAFES Awards

Dr. John Lamb won the Distinguished Teaching Award (tenured division). Distinguished Teaching Awards were established in the COAFES to recognize those members of the faculty who have made significant contributions to teaching. The Distinguished Teaching Award symbolizes



microbial ecology of bacteria in soils and water, and understanding how global change influences soil microbial processes. He has a great ability to form interdisciplinary collaborations to answer complex microbiological questions.

Professor Sadowsky has published more than 90 original articles, including those in *Nature* and *The Proceedings of the National Academy of Sciences*.

His work is widely cited by researchers in several scientific disciplines and he is a Fellow in the prestigious American Academy of Microbiology. Professor Sadowsky has given major addresses at over 50 national and international conferences and has served as editor of the prestigious *Journal of Applied and Environmental Microbiology***

the College's commitment to excellence in teaching. Lamb was nominated by Dr. Ed Nater and Dr. Jay Bell.

Dr. Claudia Uhde-Stone won the Distinguished Academic (P&A) Staff Award. Uhde-Stone is a research associate working with Dr. Deborah Allan and Dr. Carroll Vance (USDA-ARS and Adjunct Professor in Agronomy and Plant Genetics). Uhde-Stone was nominated by Allan.

Joel Nelson won the Distinguished Civil Service / Bargaining Unit Staff Award. Nelson is the manager of the Soil and Landscape Analysis Laboratory (the GIS lab) on 5th floor of Soil Science. Nelson was nominated by Dr. Jay Bell.

Dave Ruschy won the Civil Service/ Bargaining Unit Outstanding Performance Award from the Department of Horticultural Science.

■ ■ ■

**Information for Awards and Honors is from the *International Campus Update* (www.international.umn.edu/news/campusupdate), *COAFES Priorities Newsletter* (www.coafes.umn.edu) and www.grad.umn.edu.

Bell

Featured Faculty: Jay Bell

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at Virginia Tech but soon found an interest in soils. He realized that studying soils did not only pertain to agriculture, but also to a wealth of related environmental issues - something Professor Kroontje taught Bell in an environmental science class.

Bell took more soils classes, going on to earn his Master's in Agronomy in 1982 at



Virginia Tech. He worked as researcher in surface mine reclamation in Southwestern Virginia for 4 years before moving to Penn State and earning a Ph.D. in Agronomy in 1990.

Home at the University

In 1991, Bell became an assistant professor at the University of Minnesota in the Department of Soil, Water, and Climate (SWAC). It didn't take long for the College of Agriculture, Food, and Environmental Sciences (COAFES) to recognize his teaching efforts. The college awarded Bell the untenured Distinguished Teaching Award in 1995. He went on to become an associate professor in SWAC in 1997, where he received the tenured Distinguished Teaching Award.

So what makes Professor Bell such an outstanding teacher? In large part, it's Bell's philosophy that learning does not have to be separated from having fun. He believes that students have to enjoy what they are studying or else the information fails to stick with them. Bell has put his theory into practice as the Coordinator of the Environmental Sciences major.

Bell developed Wetland Soils (Soil 5555) - one of only three or four courses in the country like it. At the end of the course,

students get to apply what they learned in class by mapping wetlands on a site in the north Metro.

Both the students and Professor Bell have a lot of fun with this aspect of the class. In Soil Genesis and Landscape Relations (Soil 5515), Bell infuses his world knowledge of soils by using examples from Australia, Morocco, and China. Again, this variety and hands-on experience for the students creates interest in soil theory by seeing the applications first hand.

Bell Builds Learning Communities

Another effective learning idea that Bell believes in is building student-learning communities. This is exactly what happens with the

Soil Genesis Field Trip (Soil 8110 Colloquia) and the weekend camping retreat in Orientation to Environmental Science (ES 1128).

In the Soil Genesis Field Trip, students travel to Duluth, the Red River Valley area near North Dakota, and then make their way back to the Twin Cities. During this field trip, students learn about glacial geology and many different soil types, such as peatlands, forest and prairie soils, old beach ridges, and soils formed in lake sediments.

The students also get to know each other through the social aspect of camping out together. Bell says this fosters a positive learning environment for their future studies.

Professor Bell's belief and trust in his students doesn't stop there. In 2003/2004 he is having three environmental science seniors and one freshman help design a freshman seminar: Human Impact on the

Environment: Then and Now (ES 1905).

He has been amazed with the great ideas they have come up with, admitting that many had never crossed his mind. Bell says he is excited about the freshman seminar and thinks it should prove to be a very interesting class as well as an educational experiment.

A Push For Soil Mapping

When Bell isn't teaching, he is working as a research pedologist - someone who scientifically studies soils, including their origins, characteristics, and uses. As a pedologist, he has studied everything from mine reclamation to wetlands to remote sensing. His most recent work, however, has been with an innovative approach to soil mapping. Soil mapping has many important uses including determining property values, agriculture, forestry, and distinguishing wetland boundaries. Precision agriculture techniques also depend on that information.

By using geographic information systems (GIS) and digital terrain analysis - both techniques that allow for digital representation of landscapes - Bell has developed efficient and cost-effective soil mapping techniques.

By studying soils in a particular area and discovering relationships between soil types and the land topography, Bell has used models to predict where and what types of soils will be found in the land.

While new soil mapping techniques developed by Bell and others show great promise, old methods die hard and much of his research has been in other countries such as Australia where there are fewer obstacles to adopting new soil mapping techniques

In addition to contributing to soil science research, Bell gives back to the field by acting as an editor-in-chief of *Geoderma*, an international soil science journal published out of Holland. Bell reviews between 50 - 75 manuscripts a year. Before his *Geoderma* position, he served on the editorial



Featured Faculty: Jay Bell

board for the *Soil Science of America Journal* for five years. When Bell isn't absorbed in soil science, he can be found biking and backpacking.

He also plays guitar, a love that stems back to his days in Virginia as a band member in the Lonesome Cove String Band. The band played what Bell calls "old-time music," a precursor to Bluegrass.

He says he also did some amateur acting, where he was hanged four days a week in the longest running outdoor drama in Virginia called "The Trail of the Lonesome Pine." These days, Bell and his wife of 23 years are busy following their two sons' activities.



Dr. Wallace S. Broecker to speak on global climate change at 12th annual Kuehnast Lecture Series



Dr. Wallace S. Broecker, a world-renown climatologist and Columbia University professor, will speak about the role of sea ice in the global climate at the 12th Annual Kuehnast Lecture Series. The lecture will be from 3-5 p.m. on Tuesday, October 12 in 335 Borlaug Hall (St. Paul Campus). Dr. Broecker has won numerous awards including the prestigious National Medal of Science, conferred on him by President Bill Clinton in 1996 and the Tyler Prize for Environmental Achievement in 2002. The Kuehnast Lecture Series is sponsored through an endowment provided by the family of former Minnesota State Climatologist, Earl Louis, and his wife, Leila (Newbrough) Kuehnast.

In Memoriam

Donald J. Pluth

Dr. Donald J. Pluth died on Jan. 12, 2004. He was 67. Dr. Pluth graduated from the University of Minnesota with a B.S. in agriculture (1958), a M.S. in forest soils (1962) and a Ph.D. in forest soils (1965).

He was a member of the American Society of Agronomy (ASA) and the Soil Science Society of America (SSSA) for 37 years and taught in the Department of Soil Science at the University of Alberta for 10 years.

Pluth also helped with Introduction to Soil Science and Forest Soils as part of the Forest Science program at Alberta. He was associate editor of the *Canadian Journal of Soil Science* and continued to teach until his retirement in 2001.

Dennis R. Linden

Dr. Dennis R. Linden died on March 22, 2004. He was 61. Dr. Linden graduated from Colorado State University with a B.S. (1968) and M.S. (1971) in Agronomy. He joined the Agricultural Research Service as a soil scientist in 1970 and moved to St. Paul in 1973 to continue his work with the Soil and Water Management Research Unit. Linden finished his Ph.D. in soil science at the University of Minnesota in 1979.

He was well-known for his research on how tillage, residues and earthworms affect soil quality. Linden's work appeared in more than 70 publications and he was a member of many organizations, including the ASA and SSSA.

Pierre C. Robert

Dr. Pierre C. Robert died on December 12, 2003. He was 62. Dr. Robert graduated from the University of Liège (Belgium) with a B.S. in Geography (1963) and Sciences for Developing Nations (1966). He also completed a degree in Education (1964).

Robert joined the Department as a research associate in 1975 and received his Ph.D. in Soil Science in 1982. He founded the Precision Agriculture Center in 1995 and was considered a founding-father for precision agriculture research - giving talks in more than 20 states and 13 countries. Robert was founder and editor-in-chief of the *Journal of Precision Agriculture* and was also named a Fellow of the SSSA in 2003.

Precision Agriculture Conference

► From Page 1

the environment," said Dr. David Mulla, University of Minnesota professor and interim director of the Precision Agriculture Center.

Precision agriculture uses information technologies, like Global Positioning Systems (GPS), Geographical Information Systems (GIS), and remote sensing to target inputs and management practices to variable field conditions. These technologies take into account unique soil/landscape characteristics and pest presence, resulting in higher profits and better environmental protection.

The University of Minnesota Center for Precision Agriculture – host of the international conference since 1995 - collaborates with companies, farmers and academics to create training materials for precision agriculture. Areas of emphasis currently include studies of factors influencing crop

quality, remote sensing, yield map interpretation, intensive soil sampling methods and precision farming profitability.

"Enhancing agricultural systems is one of our College priorities. This conference and the other work of the Precision Agriculture Center helps producers combine agromonic knowledge with information management tools to produce crops efficiently and in an environmentally sound manner," said Charles Muscoplat, vice president and

- Charles Muscoplat
President and Dean, College of Agricultural, Food and Environmental Sciences

dean of the College of Agricultural, Food and Environmental Sciences.

A commemorative session was held Monday, July 26 for Pierre Robert, founder and former director for the Precision Agriculture Center. Robert - an internationally recognized precision agriculture expert - died in December after a car struck him as he was walking.

"Enhancing agricultural systems is one of our College priorities."



For more information on the Precision Agriculture Center and more information on the International Precision Agriculture Conference, visit:

► <http://www.precision.agri.umn.edu>.

Department Grad Climbs Alaska's Mt. McKinley



David Thoma with fellow climbers Colette Daigle-Berg and Ann Rodman - Photo courtesy Bill Berg



Clear skies at 17,200 feet - Photo courtesy David Thoma

For more photos visit:

► http://community.webshots.com/user/david_thoma

► <http://www.coolworks.com/gyt/blog/>



David Thoma, a recent Ph.D. graduate of the department, climbed Alaska's Mt. McKinley (20,320 feet) on June 12. Thoma ascended the mountain with four others as part of the Greater Yellowstone Team. Thoma is now a research hydrologist for the USDA-Agricultural Research Service. He works at the Southwest Watershed Research Center in Tucson, Ariz., where he uses satellite radar to make soil moisture measurements for military strategic planning purposes and ecological and watershed models. The team reached the summit at 10:45 p.m. and then started their trek back, reaching their next camp (17,200 feet) at 3 a.m.



Thoma and the Greater Yellowstone Team - Photo courtesy David Thoma

Partnership keeps Roseau above rising waters

Floodwaters in the Roseau, Minn. area caused an estimated \$120 million in damage in 2002. So when rain and snow caused the Roseau River to rise again in early May of 2004, officials and residents turned to the National Weather Service to see how high the waters would climb.

The information was vital. With that knowledge the community of 2,700 could determine how high to build its sandbag levees: the only barrier standing between it and another disaster. Members of the State Climatology Office and the Department of Soil, Water, and Climate played an instrumental role in gathering the rainfall totals needed to make an accurate crest prediction.

The Climatology Office – a unit within the Department of Natural Resources Division of Waters – contacted local Soil and Water Conservation Districts in northwestern Minnesota for reports from volunteer precipitation observers. Readings from the area soon dotted a map that was once almost empty.

“The Grand Forks radar does not supply adequate coverage around the Roseau area, so we could not count on precipitation estimates from the radar imagery,” said Andrea Holz, Red River Basin Hydrologic Forecaster for the National Weather Service.

Moreover, the National Weather Service could only rely on rainfall totals from four locations: Roseau (4.42 inches), Hallock (1.31 inches), Thief River Falls (3.34 inches) and Saum (2.34 inches). With the help of volunteer precipitation observers, the Climatology Office helped gather about 20 additional rainfall totals from the area, putting the average rainfall at 4.6 inches. Now, the weather service could make a confident prediction.



Flood waters submerged most of Roseau, Minn. in 2002 - Photo courtesy the National Weather Service, North Central River Forecast Center

“Once we had a good handle on how much and where the precipitation fell, we were able to supply a forecast for the Roseau River which was within a half of a foot,” said Holz, a former student intern with the Climatology Office. The weather service predicted the river would ascend to 21 feet. It crested at 20.5 feet.

“If we had been off by one half inch on our rainfall estimate, our stage forecast would have been off by one and a half feet,” Holz said.

The sandbag levees in Roseau held off the river for at least another year thanks, in part, to the quick action of climatologists and meteorologists associated with the Department and Climatology Office.

While the Climatology Office does not focus on gathering real-time data in most cases, the National Weather Service needed the information in a timely matter to protect life and property.

“Their ongoing challenge is to obtain the quantity of data that they require within a time frame that make the data useful,” said

Assistant State Climatologist Greg Spoden. Members of the

May 10-12, 2004

Climatology Office and Department assisted the quick gathering and compiling of rainfall totals into a usable format for river modelers at the National Weather Service – an effort made possible by volunteer precipitation observers throughout the state.

“The challenge lies in finding interested and diligent volunteers willing to take time from their busy lives to make daily measurements,” Spoden said. “In Minnesota, we enjoy the services of nearly 1,500 weather enthusiasts who make the daily trip into their backyards or farmyards.”

Individuals with close ties to the Department inspired and implemented many of the monitoring networks, including Professor Emeritus Don Baker and former State Climatologist and adjunct faculty member Earl Kuehnast. State Soil Specialist and adjunct faculty member Greg Larson also contributed to establishing the networks.

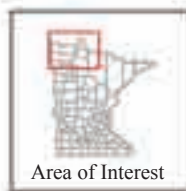
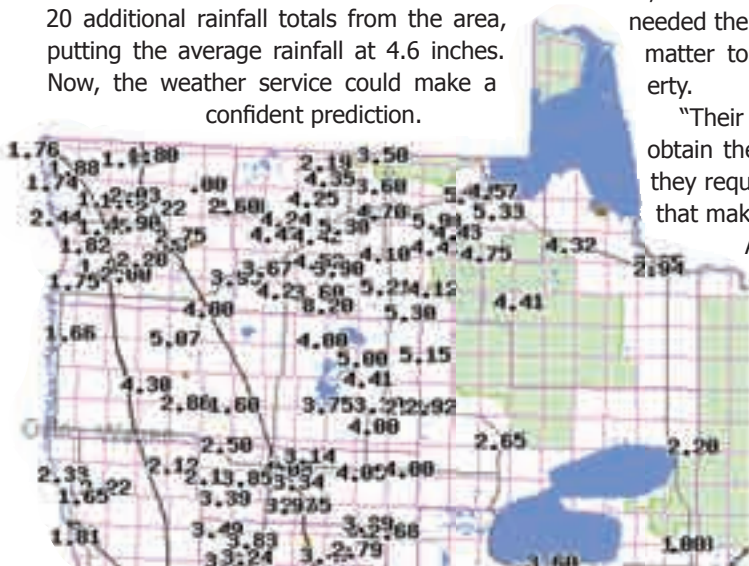
Dr. Mark Seeley, extension climatologist and meteorologist with the Department, has also regularly collaborated with the National Weather Service.

“Mark has been involved in a number of outreach programs that bring together the available resources from the University and the National Weather Service,” Spoden said.



► For more information on becoming a volunteer precipitation observer, contact the State Climatology Office at climate@umn.edu.

► On the web: http://climate.umn.edu/doc/hidden_history/appliedmain.htm



Members of the High Spatial Density Precipitation Network helped prevent another disaster - Map courtesy the State Climatology Office

Extension News

Phosphorus Prohibited

Beginning Jan. 1, 2005, Minnesotans will no longer be able to apply fertilizer containing phosphorus to their lawns. The new law will expand a restriction that already applies to the Metro area.

Exemptions:

- ▶ If a soil test indicates that phosphorus is needed
- ▶ If needed to establish a new lawn
- ▶ The law does not apply to fertilizers used on agricultural crops, flower and vegetable gardens, or golf courses.

Danger of Phosphorus:

- ▶ Phosphorus can cause the growth of algae and weeds. High amounts of this vegetation can darken water and lower oxygen levels in lakes and rivers, threatening the survival of native fish populations.



Related Links:

- ▶ Soil Test Interpretations and Fertilizer Management for Lawns, Turf, Gardens, and Landscape Plants by Rosen, C.; Bierman, P.; Eliason, R. Presents up-to-date soil fertilizer management information. Explains soil test results and contains numerous tables with specific nutrient values. 44 pages. (March 23, 2004) <http://www.extension.umn.edu/distribution/horticulture/DG1731.html>
- ▶ Minnesota Office of Environmental Assistance Phosphorus Law Fact Sheet <http://www.moea.state.mn.us/campaign/download/phosphorus.pdf>
- ▶ Minnesota Dept. of Agriculture - Summary of the new phosphorus lawn fertilizer law <http://www.mda.state.mn.us/appd/ace/phos-law.htm>

Look at the middle number on your fertilizer bag to ensure it does not contain phosphorus.

Yellow Soybeans

Farmers in western Minnesota continue to see more yellow soybeans and what's causing it is still a mystery. With millions of dollars in yields at stake, Dr. George Rehm and Dr. Paul Bloom are trying to understand what is causing the increase and how to reverse it. They want to give farmers the knowledge they need to combat iron deficiency chlorosis, which can make soybean crops susceptible to herbicide damage. Rehm and Bloom are looking at many factors that may play a role, including soil chemistry, soybean physiology and soybean genetics.

For more information on yellow soybeans visit the Integrated Pest Management (IPM) Newsletter, put out by IPM Specialist and Extension Educator Bruce Potter: <http://swroc.coafes.umn.edu/SWMNPEST/swmnpest.htm>

Related Links:

- ▶ University of Minnesota - 2003 Evaluation of Soybean Varieties for Symptoms of Iron Chlorosis <http://www.soybeans.umn.edu/crop/variety/IronChlorosis/index.htm>
- ▶ Plant Health Initiative - About Iron Chlorosis Deficiency <http://www.planthealth.info/IDC/idc.htm>



For all the latest extension news:

- ▶ <http://www.extension.umn.edu/>

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