

# Joel E. Kimmelshue, Ph.D., CPSS

Principal Soil and Agricultural Scientist

## Education

Ph.D., Soil Science/Water Resources, North Carolina State University, Raleigh, 1996  
M.S., Soil Science/Agricultural Engineering, North Carolina State University, Raleigh, 1992  
B.S., Soil Science, California Polytechnic State University, San Luis Obispo, 1990

## Professional Registrations

Certified Professional Soil Scientist (CPSS), 1997

## Professional Organizations

American Society of Agronomy  
Soil Science Society of America

## Distinguishing Qualifications

Expert/Specialist in the following areas:

- Soil/Water/Plant Relations in arid climates
- Land Use Assessments
- Water Resources
- Agricultural production systems
- Water quality
- Soil and plant relationships
- Soil nutrient interactions and environmental issues in soils
- Irrigation and drainage
- Water and soil conservation
- Soil and land use evaluations for the implementation of irrigation systems and crop production
- Agricultural land application and reuse systems for various liquid and solid byproducts

## Relevant Experience

Dr. Kimmelshue is a Principal Soil and Agricultural Scientist for NewFields Agricultural and Environmental Resources, LLC. He has experience in agricultural and water resources consulting in the western United States, and agricultural research and crop production throughout the United States and in various locations in Europe and the Middle East. Dr. Kimmelshue has managed more than \$7.0 million of projects and tasks related to Agricultural Systems, Water Resources and Water Quality.

His consulting experience includes practical and applied solutions for development of water/soil management systems and agricultural systems, specifically with irrigated agriculture. This technical expertise also includes water resources science and planning, land reclamation, soil/plant nutrient dynamics, irrigation and drainage in arid and humid climates, soil classification, and crop production, land application of municipal and agricultural wastes, vegetative and nonvegetative erosion control, and revegetation efforts.

## Selected Representative Projects – United States Work

(Includes work in the states of: Arizona, California, Colorado, Florida, Georgia, Idaho, Iowa, Louisiana, Massachusetts, Montana, Nevada, New Mexico, North Carolina, Oregon, Texas, Utah, Washington, and Wisconsin)

- **Project Manager and Technical Lead; Santa Clara River Watershed Collaborative Process; Agricultural Irrigation Thresholds for Chloride and Salinity; Fillmore, California.** This work included the development of a detailed literature review and evaluation for determination of the potential threshold of irrigation water quality constituents of concern, specifically chloride, on sensitive crops. A multitude of crops were evaluated for their individual tolerances to specific constituents of concern. Only the most susceptible crops were further evaluated and included avocados, strawberries and nursery stock. This work involved detailed assessment of water quality, irrigation practices, cultural practices and drainage management for the overall determination of acceptable irrigation water quality. The work also included comprehensive public notification efforts with stakeholder groups, public officials, researchers and farm managers. The ultimate outcome of the work has been highly influential in establishing a chloride TMDL for irrigation of sensitive species in the Santa Clara River Basin.
- **Technical Lead; Oakdale Irrigation District; Water Resources Plan; Oakdale, California.** This effort involved detailed assessment of historic land use and projections for future trends based on agricultural market conditions and urban and environmental pressures. This work also involved the development of a comprehensive water resources planning model. Main inputs to this dynamic model were crop water use estimates, water storage and conveyance, deep percolation, losses, recycled water use and overall long-term water management options for both agricultural and urban uses.
- **Technical Lead and Manager; Clark County Water Reclamation District Biosolids Management Study; Market Assessment; Las Vegas, Nevada.** This effort included a diverse evaluation of potential end use for Exception Quality (EQ) biosolids (in pelletized and bulk form) in the Las Vegas area for the Clark County Water Reclamation District. A key end use included land application to alfalfa in an arid environment. The end result included recommendations for loading, crop rotations, soil sampling and analysis, tissue sampling and analysis and potential economic return.
- **Expert Witness and Technical Lead; Crop Water Demand and Estimation of Return Flows in Irrigated and Nonirrigated Areas; Southern California Water Company; Santa Maria Basin, California.** This work involved expert witness testimony, both in deposition and in trial settings, based on an 8-month effort to assess crop water use for an historical 58-year period over a 164,000-acre basin. The work focused on pumped water and return flows to groundwater under irrigated and nonirrigated areas. Crop and native vegetation evapotranspiration and soil storage modeling was conducted. Water was assessed to insure adequate quality for sensitive crop production. The expert witness testimony included 2 days of deposition and 2 additional days of trial testimony, including cross-examination. The work was conducted as a component of a groundwater basin assessment focusing on the potential for overdraft.
- **Project Manager and Technical Lead; Pilot Study and Full-scale Reuse Program; ChevronTexaco; Richmond, California.** This water quality effort included agricultural reuse of approximately 11 million gallons of processing rinse water from a former nitrogen fertilizer manufacturing facility. The processing rinse water was registered with the State of California as a fertilizer and labeled as Nitro One. Nitro One contains approximately 4 percent total nitrogen and is currently being fertigated into irrigation water sources to supply the nitrogen demand for over approximately 11,000 acres of corn, sorghum and sudan grass crops. Total project cost is expected to approach approximately \$2.2 million. A pilot study was conducted on a cooperating farmer's land that evaluated the effects of different application rates, injection protocols and handling techniques on corn

production. A public relations campaign is currently ongoing that educates the area farmers about the benefits of using Nitro One and the management considerations of the product.

- **Technical Lead; Land Application of Former Fertilizer Processing Solids; ChevronTexaco; Fort Madison, Iowa.** This \$1.2 million project included the land application of fertilizer pond wastewater (1.5 million gallons) and solids (16,000 cubic yards) to approximately 2,200 acres of suitable farmland in Lee County, Iowa. Roles and responsibilities included management of site suitability analysis, pilot testing with Iowa State University, request for subcontractor proposal development, contract negotiations, and regulatory requirements.
- **Project Manager and Technical Lead; Detailed Nitrogen Balance Model as a Component to a Required Plan of Study (POS); Anheuser-Busch; Jacksonville, Florida.** This Plan of Study evaluated the nitrogen dynamics resulting from multiple-year application of brewery processing waters to more than 300 acres of sod grass through center-pivot irrigation systems. Products included the development of a detailed nitrogen balance historic and predictive model for improvement of site irrigation management. An assessment report and findings were presented to the Florida Department of Environmental Protection and approved for permit extension.
- **Technical Lead; Detailed Engineering Report and Wastewater Discharge Permit Application for the Washington State Department of Ecology; ALCOA and Northwest Alloys, Inc.; Chewelah, Washington.** This Report and permit were necessary for continued land application of approximately 2.0 million gallons annually of saline rinse waters to alfalfa and grass hay crops. This work involved protection of shallow groundwater that is already high in total dissolved solids (TDS). Also oversaw the monitoring and analysis of soil, crop, and groundwater testing within the land application field.
- **Technical Lead and Task Manager; Blackfeet Indian Reservation Water Right Adjudication; Bureau of Indian Affairs/Department of Justice; Browning, Montana.** Technical expert since 1997 leading efforts related to the establishment of a water rights claim for the Blackfeet Indian Tribe. These efforts have and continue to include determination of practicably irrigable acres, detailed land classification for the determination of arable and irrigable lands, present and historic irrigation delineations, water demand estimates of both agricultural and urban uses, drainage evaluations for the purpose of avoiding salinization of lands and overall task management for nearly \$1.7M of labor, subconsultants and expenses.
- **Technical Lead; Central Utah Water Resources and Land Classification Project; Central Utah Water Conservancy District; Roosevelt, Utah.** Successfully mapped nearly 10,000 acres of lands slated for supplemental irrigation and drainage improvements. Responsibilities included quality control for soil sampling and data interpretation. Co-authored a report to the Bureau of Reclamation for final project approval and certification by the United States Congress.
- **Technical Lead; Detailed Site Investigation of Infiltration Rates and Soil Characteristics; Victor Valley Wastewater Reclamation Authority; Victorville, California.** Lead consultant for site investigation for the Victor Valley Water Authority for development of rapid infiltration basins. This work involved the delineation of various soil mapping units, repeated infiltration testing, soil laboratory data interpretation, overall data analysis, and report recommendation development. Infiltration testing work was performed at the edges of the Mojave Desert to evaluate infiltration rates and provide soil profile descriptions for a variety of soils for Victor Valley Wastewater Reclamation Authority. Testing included evaluation of over 300 acres of relatively coarse-textured desert landscape overlain by finer-textured eolian (wind-blown) deposits at various depths. A network of soil profile descriptions and mobile cone-penetrometer testing was performed to locate reasonable areas for siting of infiltration basins for recharge of treated wastewater. Basins were sited according to previously determined distances from the Mojave River to allow adequate treatment capabilities through the soil matrix. The

rapid infiltration ponds were constructed successfully, are currently operational, and are satisfying the design rate estimates for infiltration of treated wastewater.

- **Technical Lead and Project Manager; Investigation of Sites for Infiltration Basins; Pajaro Valley Water Management Agency; Watsonville, California.** This work involved the evaluation of the infiltration rates through testing of a variety of soils for irrigation water infiltration, storage, and reuse. This infiltration testing was conducted to provide groundwater recharge of surface water supplies to a predominantly agricultural area that was experiencing groundwater overdraft and potential sea water intrusion. Two locations were selected for testing of native materials for siting the basins. The first location was in the dune lands of the valley directly adjacent to the Pacific Ocean. The second location was sited inland, close to the Pajaro River in fine-textured soils derived from alluvial sources. This second location was to be modified from an existing stormwater capture basin. Results of this investigation led to the construction and operation of the dune-land infiltration basin network and provided some protection from seawater intrusion into the valley. This basin is operated seasonally and aids in the overall water management plan of the Pajaro Valley.
- **Project Manager; Design and Construction of a Constructed Wetlands System for Lake County Sanitation District; Lakeport, California.** Role was to provide design and construction management services during a \$110,000 development of a constructed wetland system. The project was designed to improve and enhance wildlife habitat, beneficially reuse secondary treated wastewater, provide for public access and education, and secondarily to improve water quality.
- **Technical Lead; Detailed Engineering Report and Wastewater Discharge Permit Application for the Washington State Department of Ecology; ALCOA and Northwest Alloys, Inc.; Chewelah, Washington.** This Report and permit were necessary for continued land application of approximately 2.0 million gallons annually of saline shallow groundwater that is high in total dissolved solids. Also oversaw the monitoring and analysis of soil, crop, and groundwater testing within the land application field.
- **Technical Lead; Feasibility Study to Determine the Chemical and Hydraulic Effects of Irrigating 420,000 Gallons per Day of Saline Wastewater to an 80-acre Orchard and 75 Acres of Landscaping; IBM; San Jose, California.** This evaluation included a detailed cost estimate of modifying the existing irrigation system and management plan to accept the reuse irrigation water. It also included a comprehensive water quality evaluation that reviewed different blending ratios to insure adequate water quality according to plant species receiving this irrigation water.
- **Project Manager and Technical Lead; Caltrans Statewide Vegetative Erosion Control Review; Sacramento, California.** This \$390,000 work effort involved all aspects of project management from proposal development; presentation and interview for project; development of scope of work and budget; implementation of unique project evaluation tools; management of 11-person team, statewide field efforts; subcontractor selection and contracting; scientific publication development; and development and presentation of final report.
- **Project Manager and Technical Lead; Caltrans Nonvegetative Alternative Soil Stabilizers; Bishop, California.** This \$300,000 work effort resulted in the focus of nonvegetative erosion control technologies for soil stabilization. The project management roles of this follow-on work effort involved proposal development; presentation and interview for project; development of scope of work and budget; evaluation of multiple nonvegetative/vegetative erosion control technologies; management of eight-person team; subcontractor selection and management; and report development.
- **Technical Lead; State of California Erosion Control and Cover Establishment Guidelines; California Integrated Waste Management Board; Sacramento, California.** The end product was a practical, and easy-to-use specification to revegetate disposal areas. The specification was tailored to

separate the state into individual climatic regions for better species selections and survivability. This specification is being utilized throughout the state for revegetation of illegal dumps sites after clean up.

- **Technical Lead; Selection and Incorporation of Plant Species in a Remediation Effort; Beale Air Force Base; Sacramento, California.** This effort involved using a variety of plant and tree species within a slurry wall design for containment and natural degradation of a shallow contamination plume. This work also involved the rerouting of a seasonal stream and revegetation and irrigation of the stream channel.
- **Technical Lead; Riverbend Landfill Leachate Management Study; McMinnville, Oregon.** Developed and implemented a client-useable water balance so that the landfill could accurately monitor land application progress and nutrient loadings. Performed detailed water balance modeling and co-authored the initial Leachate Management Plan and three subsequent monitoring reports. These detailed reports were approved by the Oregon Department of Environmental Quality.

## **International Work - Selected Representative Projects**

(Includes work in the Countries of: Turkey, Israel, Jordan, and The West Bank)

- **Project Manager and Technical Lead; Development of a Reuse Feasibility Assessment for Irrigation of Conventionally Treated Wastewater; Adana, Turkey.** This work was stimulated by the need to conserve on-base water supplies at the Incirlik Air Base. The feasibility study evaluated the needs associated with the conversion of some on-base irrigation water sources from potable water to treated wastewater. This \$100,000 project limited the reliance on off-base water supplies through irrigation with treated wastewater and other conservation practices associated with landscape and crop irrigation. The use efficiency was maximized in this project because storage was limited. A nutrient and hydraulic management plan was constructed for this work to insure that no over-application of treated wastewater takes place.
- **Project Manager and Technical Lead; Development of Evaluation Strategy for Agricultural Reuse at 19 Wastewater Treatment Plant Sites throughout the Country of Jordan; Amman, Jordan.** These efforts included a technical strategy development for agricultural reuse for the currently operating 19 wastewater treatment plants in Jordan. This involved an evaluation of influencing factors such as soils, climate, crop production in the area, market conditions, cultural acceptance, wastewater quality, and crop recommendations. The technical report was used to preliminarily prioritize agricultural reuse development for specific areas.
- **Technical Lead; Development of a Feasibility Assessment for Agricultural Reuse of Treated Wastewater for the Hebron Wastewater Treatment Plant Improvements Project; Hebron, West Bank.** This work involved initial development and site location options for reuse of treated wastewater from the anticipated wastewater treatment plant serving Hebron and surrounding communities. Four main sites were evaluated according to land suitability; climatic regimes; proximity to markets; available land area; wadi discharge potential storage areas and sizing; and impact to the surrounding environment. Preliminary hydraulic and nutrient balance modeling was conducted for each site and for projected increases in treated wastewater production. This included development of water and nutrient balances for agricultural reuse with local cropping patterns.
- **Technical Lead; Development of a Master Planning Document for the Hebron Wastewater Treatment Plant Improvements Project; Hebron, West Bank.** This work involved a detailed hydraulic and nutrient loading modeling effort for the agricultural reuse component initially proposed in a previous Feasibility Assessment effort. This work was a component of an overall wastewater master planning effort and was driven by environmental and economic concerns of the region.

- **Technical Lead; Development of a Feasibility Study for the Mafraq Wastewater Treatment Plant Improvements Project; Mafraq, Jordan.** This work involved development of water and nutrient balances for beneficial agricultural reuse of treated wastewater based on various scenarios of different cropping patterns, storage sizing, and wadi discharge for forecasted wastewater flows to 2025. Managing climatic influences and the seasonality of application were optimized to maximize the land base available for application.

## Previous Experience

Before founding NewFields Agricultural and Environmental Resources, LLC, Dr. Kimmelshue spent near 11 years with CH2MHILL in various technical and leadership capacities. Prior to that, Dr. Kimmelshue worked as a research associate at North Carolina State University and managed portions of an irrigated agricultural farm in northern California, growing tree and field crops.

## Professional Responsibilities

Fellow – California Agricultural Leadership Program – Class 37 – a 2-year, intensive leadership development program designed for the advancement of future leaders in California agriculture.

National Committee Member – American Society of Agronomy Career Placement and Professional Development, Minneapolis, MN.

Board Chair and Member – Advisory Board for California Polytechnic State University Earth and Soil Sciences Department, San Luis Obispo, CA

Board Member – Advisory Board for California State University Geosciences Department, Chico, CA

Board Member – Shasta Land Trust, Redding CA

## Selected Presentations

Kimmelshue, J.E. and G. Eldridge. 2006. Agricultural Reuse – A Component of Total Water Management. National Water Resources Association. Park City, UT, July, 2006.

Heilmann, M., B. Inman, J. Kimmelshue, B. Schmid, J. Dickey, R. Coles, R. Harasick. 2006. Classification of the Owens Dry Lake Playa Surface Using Satellite Imagery and Unique Surface Characterization Methods. 2006. World Congress of Soil Science: Frontiers in Soil Science, Philadelphia, PA, July, 2006.

Kimmelshue, J.E., K. Freas and S. Sulaiman. 2006. VOYAGE – A Total Water Management Modeling Tool. AsiaWater 2006. Kuala Lumpur, Malaysia. March, 2006.

Kimmelshue, J.E. and D. Kruse. 2003. Feasibility and Water Savings of Treated Wastewater Reuse for Irrigation of Golf Course and Landscaped Areas at Incirlik Air Base. 5<sup>th</sup> Biennial European Command Joint Environmental Conference. Sonthofen, Germany.

Griffes, D., D. Meerbach, J. Kimmelshue and P. Rude. 2003. Reuse of Treated Wastewater and its Impact on the Environment : Research Priorities. The First Conference for Scientific Research at Jordan Universities. Amman, Jordan.

Kimmelshue, J.E., J. Maier, C. Peck. 2001. Land Application of 25 years of Phosphorus Fertilizer Residues. WEFTEC 2001 Annual Meetings, October 14-17, 2001. Atlanta, GA.

Kimmelshue, J.E., M. Dellinger, R. Langis, and J. Bays. 2000. Basin 2000/Lyons Creek wildlife habitat and treatment wetlands design and construction. WEFTEC 2000 Annual Meetings, Oct 16-19, 2000. Anaheim, CA.

Kimmelshue, J.E., J.W. Gilliam, and R.O. Evans. 1996. Agronomy Abstracts. Influence controlled drainage on nitrate leaching. American Society of Agronomy 88th Annual Meetings. Nov. 2, 1996. Indianapolis, IN.

Kimmelshue, J.E., J.W. Gilliam, and R.O. Evans. 1995. Agronomy Abstracts. Influence of water table management on nitrate leaching. American Society of Agronomy 87th Annual Meetings. Oct. 30, 1995. St. Louis, MO.

Kimmelshue, J.E., R.O. Evans, J.W. Gilliam, R.W. Skaggs, and D.K. Cassel. 1995. Undisturbed soil cores to evaluate leaching and evapotranspiration. North Carolina Corn, Soybean, and Small Grain Growers 6th Annual Meetings. Jan. 19, 1995. Raleigh, NC.

Kimmelshue, J.E., R.O. Evans, and J.W. Gilliam. 1994. Agronomy Abstracts. Extraction and use of large intact soil cores for monitoring the effects of controlled drainage on nitrate leaching. American Society of Agronomy 86th Annual Meetings. Nov. 16, 1994. Seattle, WA.

Kimmelshue, J.E. and J.W. Gilliam. 1992. Agronomy Abstracts. Nitrogen mineralization of <sup>15</sup>N labeled corn residue as influenced by water management. American Society of Agronomy 84th Annual Meetings. Nov. 5, 1992. Minneapolis, MN.

## **Selected Publications**

Griffes, D., D. Meerbach, J. Kimmelshue and P Rude. 2003. Reuse of Treated Wastewater and its Impact on the Environment : Research Priorities. Proceedings of: The First Conference for Scientific Research at Jordan Universities. Amman, Jordan (in press).

Sloan, A.J., M.L. Scharff, M. Hart, L. Karren. J.E. Kimmelshue, and B. Hallock. 2002. Development of the Highway Erosion Assessment Tool (HEAT) for evaluation of roadside slopes in California. Proceedings of the International Erosion Control Association Conference, Orlando, FL, February 25-March 1, 2002.

Kimmelshue, J.E., J. Maier, and C. Peck. 2001. Land Application of 25 Years of Phosphorus Fertilizer Residues. WEFTEC 2001 Technical Proceedings.

Kimmelshue, J.E., R. Langis, M. Dellinger and J. Bays. 2000. Wildlife Habitat and Treatment Wetlands Design and Construction. Treatment Wetlands for Water Quality Improvement - Quebec 2000 Conference Proceedings (Selected Papers). CH2M HILL, Waterloo.

Kimmelshue, J.E., M. Dellinger, R. Langis, and J. Bays. 2000. Basin 2000/Lyons Creek wildlife habitat and treatment wetlands design and construction. WEFTEC 2000 Technical Proceedings.

Kimmelshue, J.E., R.O. Evans, and J.W. Gilliam. 1996. Extraction and instrumentation of round soil monoliths for monitoring evapotranspiration and solute movement. Evapotranspiration and Irrigation Scheduling in Proceedings of International Conference of American Society of Agricultural Engineers.

Kimmelshue, J.E., J.W. Gilliam, and R.J. Volk. 1995. Water management effects on mineralization of soil organic matter and corn residue. Soil Science Society of America Journal. 59:1156-1162.

Kimmelshue, J.E., J.W. Gilliam, and R.O. Evans. 1996. The influence of drainage management and nitrogen additions on nitrate leaching. Soil Science Society of North Carolina Proceedings.

Kimmelshue, J.E., R.O. Evans, and J.W. Gilliam. 1995. Extraction and use of large intact soil cores and a field site in drainage management studies. Soil Science Society of North Carolina Proceedings. 38:83-87.

Kimmelshue, J.E. and J.W. Gilliam. 1993. Controlling the mineralization of organic nitrogen in lower coastal

plain soils. Soil Science Society of North Carolina Proceedings. 36:29-34.

Kimmelshue, J.E. 1996. The influence of drainage management and nitrogen fertility practices on nitrate leaching. Ph.D. dissertation. North Carolina State University. Raleigh, NC.

Kimmelshue, J.E. 1992. Nitrogen mineralization of <sup>15</sup>N labeled corn residue as influenced by water management. MS thesis. North Carolina State University. Raleigh, NC.

Kimmelshue, J.E. 1990. Sulfur additions to an alkaline soil in the northern Sacramento Valley of California and influence on almond production. BS thesis. California Polytechnic State University. San Luis Obispo, CA.

## **Selected Presentations**

Kimmelshue, J.E. and G. Eldridge. 2006. Agricultural Reuse – A Component of Total Water Management. National Water Resources Association. Park City, UT, July, 2006.

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Kimmelshue, J.E., K. Freas and S. Sulaiman. 2006. VOYAGE – A Total Water Management Modeling Tool. AsiaWater 2006. Kuala Lumpur, Malaysia. March, 2006.

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Kimmelshue, J.E., J. Maier, C. Peck. 2001. Land Application of 25 years of Phosphorus Fertilizer Residues. WEFTEC 2001 Annual Meetings, October 14-17, 2001. Atlanta, GA.

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Kimmelshue, J.E. and J.W. Gilliam. 1992. Agronomy Abstracts. Nitrogen mineralization of  $^{15}\text{N}$  labeled corn residue as influenced by water management. American Society of Agronomy 84th Annual Meetings. Nov. 5, 1992. Minneapolis, MN.