



Joel Kimmelshue, Ph.D., CPSS
Principal Agricultural and Soil Scientist
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Education

Ph.D., Soil Science (Water Resources concentration), North Carolina State Univ., Raleigh, 1996
M.S., Soil Science (Ag Engineering concentration), North Carolina State Univ., Raleigh, 1992
B.S., Soil Science (Crop Sci. concentration), California Polytechnic State Univ., San Luis Obispo, 1990

Professional Registrations and Organizations

Certified Professional Soil Scientist (CPSS - #18204) – American Registry of Certified Professionals in Agronomy, Crops and Soils; American Society of Agronomy; Soil Science Society of America

Distinguishing Qualifications

Expert/Specialist in the following areas:

- Land Use Assessments and Crop Identification
- Production Agricultural Systems
- Soil/Water/Plant Relations
- Irrigation and Drainage Management
- Crop Consumptive Use Estimates
- Expert Witness Testimony
- Soil and Land Use Evaluations for Irrigation Development
- Water Resources
- Nutrient and Salinity Management
- Agricultural Land Application and Reuse Systems
- Soil and Water Salinity Management
- Dust and Erosion Control
- Water Quality for Irrigated Agriculture
- Regulatory Support and Negotiation
- Policy, Regulatory, and Environmental Influences on Ag Production Systems
- Soil and Water Conservation
- Agricultural Research

Relevant Experience

Dr. Kimmelshue is a Principal Soil and Agricultural Scientist for Land IQ. Dr. Kimmelshue is also a founding owner in the firm. He has experience in agricultural and water resources consulting in the western United States (especially California), and agricultural research and crop production throughout the United States. This experience stretches to various locations in Europe and the Middle East. Dr. Kimmelshue has performed technical leadership and/or managed numerous projects and tasks of nearly \$20 million dollars over the past 21 years.

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Dr. Kimmelshue's 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 expert witness testimony, crop consumptive use estimates, erosion and dust control, regulatory support and negotiation, water resources science and planning, land reclamation, soil/plant nutrient dynamics, irrigation and drainage in arid and humid climates, soil classification, crop production, land application of municipal and agricultural wastes, and revegetation/reclamation efforts.

Predominantly, the objective scientific work that Dr. Kimmelshue performs is driven by ever-changing policy, legislative, and environmental pressures on production agricultural systems. Dr. Kimmelshue thoroughly understands these drivers and applies sound scientific results to help his clients address these challenges.

Select Representative Projects – Domestic

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

Representative projects include:

- **Project Manager and Technical Lead–Cold Water Rice Yield Loss Determination; Western Canal Water District, Richvale Irrigation District, Biggs West Gridley Irrigation District; Cold Water Influences on Rice Yield; Nelson, Richvale, and Gridley, CA.** This project centered on the development and implementation of Settlement Agreement technical protocols between the three Districts (approximately 100,000 acres) and the California Department of Water Resources. The implementation of this Agreement will result in payment by the State of California to the growers within the Districts for loss of rice yield due to cold water diversion from the State Water Project at Oroville Dam and the Thermalito afterbay. The determination of yield loss is being conducted using aerial, satellite and other remote sensing techniques. This approach is being correlated to field measured yield losses utilizing grower owned and operated, combine-equipped GPS yield monitors. Also, in-canal temperature measurements were taken at 125 locations throughout the Districts for a period of up to 90 days. A temperature interpolation map and equation has been developed and is a third method of estimating yield loss determination. These three methods are being correlated against each other for an ultimate yield loss estimate. This work involves consistent contact and interaction with Districts' managers and staff, representatives from the California Department of Water Resources in Sacramento and Red Bluff, cooperating growers, and sub-consultants.
- **Principal In Charge/Technical Specialist – Statewide Spatial Mapping of Almonds, Walnuts, Pistachios, and Dried Plums; Almond Board of California, California Walnut Commission, California Pistachio Research Board, California Dried Plum Board; Modesto/Sacramento/Fresno, CA.** Dr. Kimmelshue is currently leading an intensive state-wide, field by field mapping product of all almonds, walnuts, pistachios, and dried plums across the entire state of California. Due to the rapid expansion of these tree crops, understanding of actual acres, age, and location in comparison to water sources, environmentally sensitive areas, transportation corridors, other crop types, and many other attributes are increasingly important to these four commodity organizations. The resultant work is a highly accurate, timely, and cost-effective crop mapping product. The technology

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employed for this work is a combination of inherent agronomic knowledge of cropping systems in California, remotely sensed attributes, and use of multiple additional lines of evidence.

- **Technical Lead and Project Manager – Kern River Watershed Coalition Authority, Sub Basin Review of Agricultural Irrigation and Drainage Practices and Crop Impacts; Bakersfield, CA.** Dr. Kimmelshue was retained by the KRWCA as an expert in providing sound technical agronomic information related to the unique irrigation and crop production practices of the Kern Sub Basin area within the Southern San Joaquin Valley Water Quality Coalition. This work involved understanding and interpreting changes in cropping patterns, irrigation methods, salinity management, fertilization practices and overall water and nitrogen use efficiency. A portion of this work included intensive ground truthing for development of remotely sensed crop mapping products. Those ground truthing data included permanent crop irrigation method documentation for use in irrigation method change over time.
- **Technical Lead – San Joaquin River Restoration Program, Seepage Management Plan, Expert Review Panel Member; United States Bureau of Reclamation; Sacramento, CA.** Dr. Kimmelshue was retained as a salinity, agricultural production, and irrigation and drainage expert to review a completed current version of the Seepage Management Plan for seepage impacts to agriculture including acceptable water table depths, salinity management, yield decline, remotely sensed solutions and irrigation and drainage management considerations. This work will result in completion of a comprehensive management document offering a review of thresholds, solutions and mitigation opportunities as a result of future increased flows in the San Joaquin River.
- **Project Manager and Technical Lead–Historic and Present Crop Evaluation and Water Use Estimate; Brownstein, Hyatt, Farber, Schreck – Water Law Firm – representing a Confidential Client; Bakersfield, California.** This project involved the historic and present quantification of water use at a confidential site near Bakersfield. Historic remote sensing imagery was acquired to determine the irrigated area changes over time as well as the cropping pattern shifts from the early 1950s to present day. Water use estimates were determined for the current cropping patterns as well as diverted water quantities. A comprehensive site evaluation was performed with the client and area grower/owner to determine soil type, water conveyance, irrigation methods and management, storage, crop types, etc. This work was used to facilitate a potential substantial land purchase and water rights quantification.
- **Expert Witness and Technical Lead–Prepared Testimony for United States District Court – Eastern District of California; Judge Oliver W. Wanger; Tehama Colusa Canal Authority Water Deficit Evaluation; Willows and Fresno California.** Dr. Kimmelshue was retained to prepare a detailed evaluation of the influence of regulated deficit irrigation on a variety of crops including almonds, grapes, walnuts, rice, olives, alfalfa, tomatoes and a variety of other permanent and annual field and row crops. The preparation of this testimony was conducted to determine the influence of a deficit of irrigation water at predetermined periods of the growth cycles of the crops mentioned above – predominantly focusing on perennial crops such as almonds. The results of this work indicate the extreme detrimental influence of insufficient irrigation during key growth stages of the crop.
- **Expert Witness and Technical Lead–Prepared Testimony for Santa Clara County Superior Court; Judge Jack Komar; Crop Water Demand and Estimation of Return Flows in Irrigated and Nonirrigated Areas; Southern California Water Company; Santa Maria, California.** This project

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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 ensure 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. This was a multi-stakeholder case, which included agricultural, urban and local, state, and federal agencies.

- **Expert Witness and Technical Lead—Perparing Testimony for Los Angeles County Superior Court; Judge Jack Komar; Crop Water Demand and Estimation of Return Flows in Irrigated and Non-irrigated Areas; Antelope Valley Groundwater Agreement Association; Lancaster, California.** This work centered around the quantification of a water right adjudication of the Antelope Valley. Dr. Kimmelshue represented the agricultural interests in the Valley and conducted a detailed and comprehensive assessment of crop water use, irrigation methods and efficiencies, return flows, and other parameters to ultimately assess a component of the safe yield of the groundwater basin based on agricultural pumping. This work was prepared for expert witness testimony in early 2011. Modeling was conducted to assess not only a variety of crop types in irrigated agricultural, but also irrigated urban areas.
- **Project Manager and Technical Lead—Blending of Saline Mine Water with Central Arizona Project (CAP) Water for Irrigation to Cotton, Alfalfa, and Sod; Rio Tinto Mining Company – Resolution Copper; Superior and Queen Creek, Arizona.** Dr. Kimmelshue is leading an effort to create an acceptable blended water quality for irrigation to alfalfa, cotton and sod on approximately 5,500 acres of land within the New Magma Irrigation and Drainage District (NMID). This project involves direct working efforts with the USBR, the state of Arizona Lands Department, NMID, the University of Arizona Soil, Water and Environmental Science Department, and the Resolution Copper Company. Many of these multi-stakeholder meetings were for the purpose of obtaining permitting documents and satisfying the discharge requirements. The work involves real-time monitoring of treated mine water, CAP water, and the blended result. This monitoring network comprises in-canal Total Dissolved Solids (TDS), temperature, and pH probes. A web-based portal will be used for instantaneous water quality assessment and tracking. Also, a comprehensive soil, water, and tissue sampling program will take place at least quarterly during this 5-6 year project. Crop growth stages and tracking will also be conducted. The dewatering of this mine is necessary to make copper ore available from the largest copper mine in North America.
- **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, sub consultants, and expenses.

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- **Technical Specialist – Owens Lake Dust Control; Los Angeles Department of Water and Power; Los Angeles/Lone Pine, CA.** For more than a decade Dr. Kimmelshue has provided senior technical expertise on a large variety of dust control efforts on the Owens Lake Dust Control Project. Historically, this area was one of the largest dust emission sources in the western hemisphere. Over time, Dr. Kimmelshue has provided objective scientific leadership on development, testing and large-scale (thousands of acres) implementation of various dust control technics and methodologies. These efforts specifically focus on analysis of various environmental conditions including soil type, climate, seasonality of emissions, water quality, relative land disturbance. Based on those analyses, various methodologies to control source areas and challenging surface emissions in harsh environmental conditions have been achieved. Control methodologies include source control, soil binders, revegetation, shallow flooding and various tillage operations.
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- **Project Manager and Technical Lead–Irrigation Water Reuse – Water Demand Estimates and Water Quality Suitability; City of Hollister and San Benito County Water District; Hollister, California.** This project involved the quantification of water needs assessment from both a quantity and quality perspective for irrigation with treated wastewater. Dr. Kimmelshue led multiple public education sessions related to the water quality and worked closely with both the City and Water District to ensure acceptance by the farming community. Water quality and quantity estimates were determined and were coupled with appropriate crop types and practices. A key portion of this work involved an update of the Recycled Water Master Plan for approval by the Regional Water Quality Control Board and other entities.
- **Project Manager and Technical Lead–Santa Clara River Watershed Total Maximum Daily Load (TMDL) Collaborative Process; Agricultural Irrigation Thresholds for Chloride and Salinity; Los Angeles County Sanitation Districts; Fillmore, California.** This project 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 as a basis of a TMDL process in working with the California Regional Water Quality Control Board. This collaborative process included work with a multitude of stakeholders including the California Avocado Commission, the California Strawberry Commission, Nursery Crop Growers, Ventura County Farm Bureau, and Los Angeles County Sanitation Districts. 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.
- **Principal In Charge/Technical Specialist – Dust Control in Almonds; Almond Board of California/California Department of Food and Agriculture, Modesto/Sacramento, CA.** Dr. Kimmelshue is currently providing senior technical expertise on a state-wide dust control testing project through the Almond Board of California as funded by the California Department of Food and Agriculture Specialty Crop Block Grant Program. This project is being conducted to ascertain the

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effectiveness of application of $MgCl_2$ as a dust suppressant in almond production. Different rates of application are being tested to assess relative dust suppression coupled with agronomic suitability and environmental protection. This project began in October of 2012 and will continue through June of 2015. Environmental testing including air emissions and comprehensive soil testing, analysis and interpretation. Expected results include determination of an acceptable range of application rates as related to soil type, irrigation method, and orchard floor management.

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- **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 POS 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 project 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.
- **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 Department of Food and Agriculture as an agricultural mineral and labeled as Nitro One. Nitro One contains approximately 4 percent total nitrogen. 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 was conducted to educate the area farmers about the benefits of using Nitro One and the management considerations of the product.
- **Project Manager and Technical Lead—Coalbed Methane Produced Water Discharge and Irrigation Suitability; Petroglyph Operating Company; La Veta, Colorado.** Dr. Kimmelshue evaluated the suitability of highly concentrated sodium-rich water from a coalbed methane operation for discharge and irrigation to corn and alfalfa near Walsenburg, Colorado. This work involved evaluating soil and water amendments to compensate for the high sodium concentrations. This

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challenging project involved public presentations at local community forums as well as ongoing collaboration with Colorado State University and the Colorado Cooperative Extension Service.

- **Technical Lead–Nutrient Management for the City of Los Angeles Biosolids Land Application Farm; City of Los Angeles Bureau of Sanitation; Bakersfield, California.** Over the past 8 years, Dr. Kimmelshue has been the lead technical consultant for the City of Los Angeles biosolids land application program at Green Acres Farms. This project involved a multitude of nutrient management programs and land application recommendations including irrigation, crop and overall farm management (including a Comprehensive Farm Management Plan) for the 5,000-acre site. The farm receives and beneficially reuses Class A biosolids from multiple municipal treatment plants in the Los Angeles Basin. Recent work involved the refinement of soil and plant tissue monitoring plans, a phased soil amendment schedule, crop fair market value assessment, and customized biosolids database and agronomic loading rate calculation tool Cybersolids™ for use at Green Acres Farm.
- **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 ensure adequate water quality according to plant species receiving this irrigation water.
- **Technical Lead–Soil Salinity Evaluation; Glenn Colusa Irrigation District (GCID); Willows, California.** This soil salinity evaluation took place over approximately 200,000 acres of within GCID and some neighboring Districts. Dr. Kimmelshue managed and worked with GCID staff to sample the entire District and adjacent areas for soil salinity within the root zone. Sampling and analysis results were compared with historical measurements by the U. S. Bureau of Reclamation (USBR). The trend of salinization was analyzed for its relationship to long-term irrigation management, including a regulatory drought during which irrigation was curtailed throughout the District.
- **Technical Lead; Water Resources Plan–Oakdale Irrigation District; 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 project 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

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potential end-use for Exceptional 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.

- **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 USBR 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 project 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 seawater 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 an \$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.

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- **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.
- **Project Manager and Technical Lead—Caltrans Statewide Vegetative Erosion Control Review; Sacramento, California.** This \$390,000 project 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 project 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 project 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.

Select Representative Projects – International Work

(Complete work experience includes efforts in the countries of: Turkey, Malaysia, Germany, Egypt Israel, Jordan, and The West Bank) Representative projects listed here include:

- **Project Manager and Technical Lead—Development of a Reuse Feasibility Assessment for Irrigation of Conventionally Treated Wastewater; Adana, Turkey.** This project was stimulated by the need to conserve on-base water supplies at the Incirlik Air Base. The feasibility study evaluated the needs

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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 ensure 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 project 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 impacts 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 project 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 project 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 co-founding Land IQ, LLC, Dr. Kimmelshue spent over 11 years with CH2MHILL. During that time, Dr. Kimmelshue was the firm-wide leader for Agricultural Services Technology, which represented nearly 70 people throughout the firm. Dr. Kimmelshue was also the Business Development Lead for all water resources related projects for a 7-state southwestern region. 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, producing a variety of tree, field, and row crops.

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Professional Responsibilities and Accomplishments

State Committee Member – California Department of Food and Agriculture – Specialty Crop Block Grant Advisory Committee – A 6-year appointment for review and selection of proposals for up to \$16M in United States Department of Agriculture funding annually. Sacramento, CA

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

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

Participant – California Water Education Foundation Tours – Sacramento Valley and Central Valley Tours.

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

Select Publications and Presentations

Publications

Kimmelshue, J., M. Heilmann, Z. Wang, S. Mulder, C. Stall, M. Twietmeyer, G. Ludwig, R. Klein, C. Eidsath, G. Obenauf. 2016. California Statewide Crop Mapping for Resource Management and Regulatory Compliance. Manuscript in Development. To be submitted to California Agriculture.

Ludwig, G., D. Hunter, J. Kimmelshue, M. Heilmann, Z. Wang, S. Mulder, C. Stall, M. Twietmeyer. 2016. Development of a Statewide Spatial/Mapping Database for Almonds, Walnuts, and Pistachios – Final Report. California Department of Food and Agriculture/United States Department of Agriculture – Specialty Crop Block Grant Program. USDA Project No. 26235.

Kimmelshue, J., M. Heilmann, Z. Wang, S. Mulder, M Twietmeyer, R. Spell, C. Stall. 2015. Statewide Tree Crop Mapping of Dried Plums. California Dried Plum Board – Research Reports
2015. <http://ucanr.edu/repository/fileaccess.cfm?article=160095&p=BSKEQB&CFID=164917629&CFTOKEN=87232494> .

Kimmelshue, J., M. Heilmann, Z. Wang, S. Mulder, M Twietmeyer, R. Spell, C. Stall. 2015. Statewide Walnut Tree Crop Mapping and Age Determination. California Walnut Board Research Committee – Annual Research Report.

Kimmelshue, J., Z. Wang, M. Heilmann, S. Mulder, C. Stall, R. Spell, G. Ludwig, R. Klein, D. Balint. 2015. Development of a Statewide Spatial Database for Walnuts, Almonds, and Pistachios. Almond Board of California Final Research Report. 14-STEW CROP4-Kimmelshue. Almond Board of California 2014.2015 Annual Research Report. <http://www.almonds.com/growers/resources/research-database> .

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Kimmelshue, J., M. Heilmann, Z. Wang, S. Mulder, M. Twietmeyer, R. Spell, C. Stall. 2015. Statewide Pistachio Tree Crop Mapping and Age Determination. California Pistachio Research Board – Annual Research Report.

Kimmelshue, J., D. Smith, Z. Wang, S. Tillman. 2013. Mapping Spatial Distribution of Almonds Using Remote Sensing – Enhancements of Existing Methods and Product for Applications. 12-STEWCR0P4-Kimmelshue. Almond Board of California 2012.2013 Annual Research Reports. <http://www.almonds.com/growers/resources/research-database> .

Kimmelshue, J., D. Williams, S. Tillman, T. DeJong, W. Salas. D. Smart. 2012. Remotely Sensed Determination of Orchard Removal Biomass – Assess Carbon Sequestration Potential of Applying Chipped Almond Prunings to the Orchard Floor. 11-STEWCR0P4-Kimmelshue. Almond Board of California 2011.2012 Annual Research Reports. <http://www.almonds.com/growers/resources/research-database>.

Presentations

Kimmelshue, J., M. Heilmann, Z. Wang, S. Mulder, M. Twietmeyer, C. Stall. 2016. Statewide spatial mapping of almonds, walnuts, pistachios, and dried plums in California – results, interpretations, and applications. Featured Scientific Seminar. Invited for Presentation to the International Nut and Dried Fruit Council (INC) XXXV World Nut and Dried Fruit Congress. May 31, 2016. San Diego, CA.

Kimmelshue, J., M. Heilmann, Z. Wang. 2016. Results of Statewide Spatial Almond Mapping and Applications: Acreage, Age Determination, Recharge Suitability, Crop Change. Board of Directors for the Almond Board of California. April 12, 2016. Modesto, CA.

Stall, C., Z. Wang, S. Tillman, J. Kimmelshue. 2016. DWR Cold Water Rice Project Update and Introduction to a Web-Based Information System. Western Canal Water District and Richvale Irrigation District Grower Meeting. March 24, 2016. Richvale, CA.

Heilmann, M., J. Kimmelshue. 2016. 2015 Delta Land Use Mapping. In conjunction with Comparative Study of Methods for Measuring Consumptive Use of Water in the Delta. Office of the Delta Watermaster, State Water Resources Control Board. March 17, 2016. Sacramento, CA.

Kimmelshue, J., M. Heilmann, Z. Wang, S. Mulder, M. Twietmeyer, C. Stall. 2016. Remote Sensed Evapotranspiration Estimates and Crop Mapping within the Sacramento/San Joaquin Delta and Beyond. University of California, Division of Agriculture and Natural Resources – UC Davis Evapotranspiration Remote Sensing Workshop. February 10, 2016. Davis, CA.

Kimmelshue, J., M. Heilmann, Z. Wang, S. Mulder, M. Twietmeyer, C. Stall. 2016. Results of Statewide Spatial Tree Crop Mapping and Applications: Acreage, Age Determination, Recharge Suitability, and Crop Change. American Society of Agronomy – California Chapter Annual Meetings. February 2, 2016. Visalia, CA.

Heilmann, M., J. Kimmelshue, M. Twietmeyer. 2015. Groundwater Recharge Suitability – Statewide Almond Production. The Almond Conference. December 5, 2015. Sacramento, CA.

Kimmelshue, J., M. Heilmann, Z. Wang, S. Mulder. 2015. Statewide Dried Plum Mapping – Final Results. California Dried Plum Research Committee. December 16, 2015. Sacramento, CA.

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Kimmelshue, J., M. Heilmann, M. Twietmeyer. 2015. Almond Groundwater Recharge Suitability. BOD Reputation Management & Agriculture Issues Management (AIM) Taskforce. November 2, 2015. Modesto, CA

Heilmann, M., J. Kimmelshue, Z. Wang, S. Mulder, C. Stall, M. Twietmeyer. 2015. Walnut Mapping and Groundwater Recharge Suitability. Walnut Board of California. December 1, 2015. Folsom, CA.

Kimmelshue, J., M. Heilmann. 2015. Crop Mapping Progress Overview and Update. California Department of Water Resources. October 30, 2015. Sacramento, CA.

Stall, C., Z. Wang, J. Kimmelshue. 2015. Conventional and Wild Rice Mapping Statewide. California Wild Rice Advisory Board and Researchers. July 13, 2015. Yuba City, CA.

Heilmann, M., J. Kimmelshue, Z. Wang. 2015. Remotely Sensed Land Use Applications in Agricultural Systems. United States Congress on Irrigation and Drainage Technical Meetings. June 4, 2015. Reno, NV.

Kimmelshue, J., M. Heilmann, S. Mulder, C. Stall, Z. Wang. 2014. Preliminary Conclusions of Statewide Crop Mapping of Almonds. The Almond Conference. December 10, 2014. Sacramento, CA.

Kimmelshue, J., M. Heilmann. 2014. Results of Remote Sensing for Crop Identification – Citrus. Citrus Research Board and California Citrus Mutual. November 17, 2014. Visalia, CA

Kimmelshue, J., S. Mulder, M. Heilmann, S. Tillman. 2014. An Introduction to Scientific Approaches for Implementation of Future Regulations – A Spatial Approach. California Citrus Showcase. March 6, 2014. Visalia, CA.

Kimmelshue, J., M. Heilmann, Z. Wang. 2014. Results of Remote Sensing of Tree Crops. California Pistachio Research Board. January 30, 2014. Fresno, CA.