UniverCity Year Dane County

Advancing equity and sustainability throughout Dane County

2017-2019

UniverCity Alliance
UNIVERSITY OF WISCONSIN–MADISON

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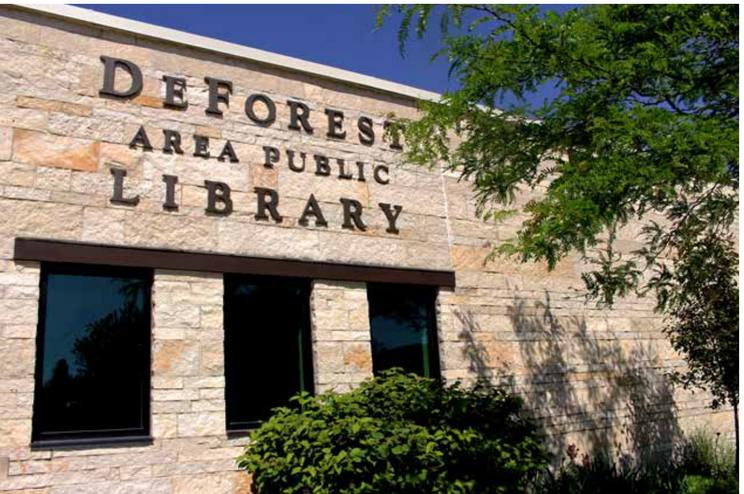


About UniverCity Year

UniverCity Year helps Wisconsin communities find practical solutions to their toughest challenges.

We focus UW-Madison's latest research, state-of-the-art technology, and award-winning faculty and student scholars on the needs of a single community.

Using a three-phase approach, we meticulously plan projects, deliver innovative research and design recommendations, and offer expert implementation support.

Communities guide us. We address needs that community leaders identify and engage local stakeholders during every phase of the program.

We excel at big ideas that ignite visionary plans. We're also deliberately focused on feasible recommendations that align with a community's culture and circumstance.

The Wisconsin Idea drives us. We collaborate with towns, cities, counties and clusters of communities to improve the places and lives of people across Wisconsin.

We create better places together.

UW-Madison students researched projects in communities throughout Dane County. They found McKee Farms Park in Fitchburg (top two photos) an asset to a nearby proposed affordable housing development. An environmental conservation plan for Door Creek included analysis of the level of algae within Lake Kegonsa in Stoughton (bottom right). Students looked for key amenities, like the DeForest Area Public Library, to make proposed developments more attractive to potential residents (bottom left).

The issues facing Dane County

Since its formation as a territorial county in 1836, Dane County has seen constant population growth. With approximately 523,000 residents, it is the second largest county in Wisconsin and the fastest growing county in Wisconsin. Meanwhile, agriculture remains an important part of the county's past, current and future economy.

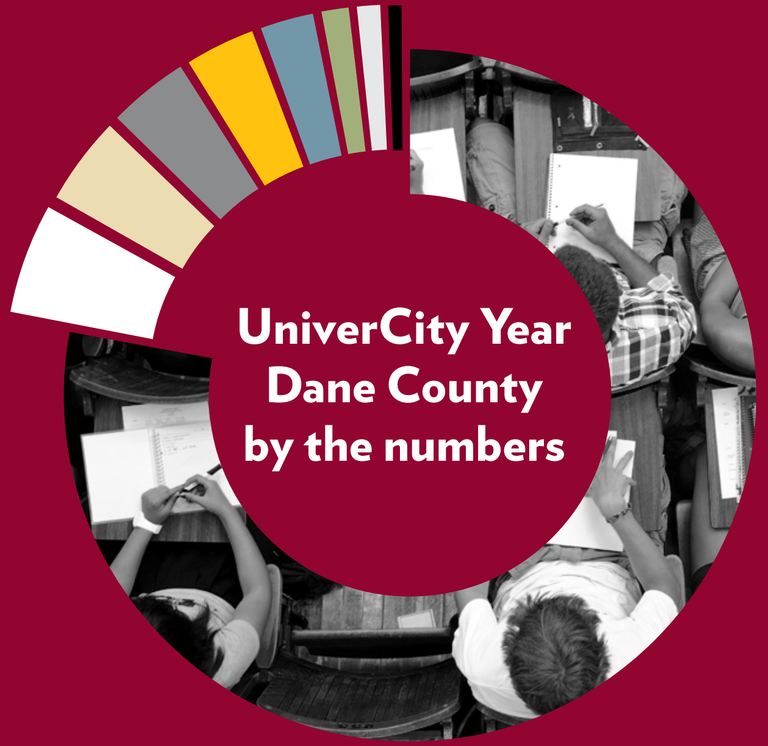
Responding to residents' changing needs, eliminating racial inequity, and preserving natural resources and ecosystems for all current and future residents requires a variety of innovative and effective government policies and programs. In need of in-depth analysis and best practice recommendations, the Dane County Board of Supervisors partnered with UniverCity Year during 2017-2019.

Supervisors identified four areas of focus, all interconnected by themes of equity and sustainability, including:

- *Closing the Housing Gap*
- *Economic Development*
- *Frequent Users of County Services*
- *Water Quality and Nutrient Management*

A retention pond in Fitchburg helps control runoff to the surrounding neighborhood.

The Dane County Board of Supervisors, made up of 37 elected representatives, makes policies, enacts ordinances, levies taxes and appropriates money for services.



UniverCity Year Dane County by the numbers

- 389 students
- 26 projects
- 21 UniverCity Alliance board members
- 20 courses
- 16 faculty
- 12 UW-Madison departments
- 8 UW-Madison schools and colleges
- 5 Dane County project leads
- 2 UW-Madison staff

Acknowledgments

Thank you to the numerous Dane County officials and staff who were essential to this project's success.

County Board Chair Sharon Corrigan championed our partnership both within the board and in the community. Her conversations with several stakeholders made all the difference in the long-term viability of UniverCity Year.

County Board staff led project teams, attended classes and provided feedback to ensure students' research aligned with the county's needs.

- ***Ela Kakde**, innovation intern, led the Economic Development projects and introduced the board to UniverCity Year*
- ***Lauren Kuhl**, legislative management system specialist, led the Water Quality and Nutrient Management projects and coordinated the overall partnership*
- ***Lisa MacKinnon**, sustainability and program evaluation coordinator, led the Closing the Housing Gap projects and provided program development expertise to strengthen UniverCity Year processes*
- ***Karin Peterson Thurlow**, chief of staff, facilitated project planning and helped UniverCity Year staff navigate county government*
- ***Lila Walsh**, election support specialist, led the Frequent Users of County Services projects and was a voice for the county's most vulnerable residents*

We are grateful for the Dane County supervisors and staff members who shared their expertise with UW-Madison staff, faculty and students.

- *Supervisor Nikki Jones*
- *Supervisor Mary Kolar*
- *Supervisor Robin Schmidt*
- *Supervisor Shelia Stubbs*
- *Supervisor Hayley Young*
- *Ron Chance*
- *Rob Dicke*
- *Lynn Green*
- *Bill Hanna*
- *Aaron Krebs*
- *Peter Ouchakoff*
- *Olivia Parry*
- *David Phillips*
- *Todd Violante*

Thank you to the UW-Madison professors who made space for UniverCity Year projects in their courses and taught students how to collaborate with community partners.

- *Courtney Berner*
- *J. Michael Collins*
- *Lori DiPrete Brown*
- *Barbara Duerst*
- *Tom Eggert*
- *Andrea Hicks*
- *Arlyne Johnson*
- *Kyung-Sun Kim*
- *James LaGro*
- *Tom Landgraf*
- *Jaime Luque*
- *Kurt Paulsen*
- *Anne Reynolds*
- *Neil Stenhouse*
- *Christopher Wells*
- *Scott Williams*

Learn more about UniverCity Year Dane County

This booklet provides a brief glimpse into the work of hundreds of UW-Madison students and faculty. For detailed information on project goals, research methods, findings and recommendations, download students' final reports from the UniverCity Year website at univerCity.wisc.edu/danecounty.

Closing the Housing Gap

Civil Engineering 421: Environmental Sustainability Engineering. Professor Andrea Hicks. "Impact analysis of sustainable home systems and features"

Landscape Architecture 351: Housing and Urban Design. Professor James LaGro. "Designing distinctive communities in DeForest"

Real Estate 365/765: Residential Health. Professor Tom Landgraf. "Housing for aging residents: Proposals for DeForest and Windsor"

Real Estate 420/720: Urban and Regional Economics. Professor Jaime Luque. "Closing the housing gap in Dane County: Site analyses, values and risks"

Real Estate 611: Residential Property Development. Professor Tom Landgraf. "Concepts for multi-family and small-lot developments in DeForest and Fitchburg"

Real Estate 651: Green Sustainable Development. Professor Tom Landgraf. "Solar energy considerations for residential and commercial properties"

Urban and Regional Planning 611: Urban Design: Theory and Practice. Professor James LaGro. "Guidelines for affordable and workforce housing in Dane County"

Urban and Regional Planning 844: Housing and Public Policy. Professor Kurt Paulsen. "Housing needs assessment"

Economic Development

Agricultural and Applied Economics 323: Cooperatives. Professors Anne Reynolds and Courtney Berner. "Housing, childcare, food: How cooperatives can help build a stronger, more resilient workforce"

Environmental Studies 402: People, Environment and Sustainability. Professor Tom Eggert. "Providing resources and creating opportunities for all Dane County residents"

Life Sciences Communication 515: Public Information Campaigns and Programs. Professor Neil Stenhouse. "Increasing memberships in Community-Supported Agriculture (CSA)"

Frequent Users of County Services

Global Health Institute: Quality Improvement Leadership Institute. Professor Lori DiPrete Brown. "Comprehensive Community Services program development plan"

Journalism 677: Concepts and Tools for Data Analysis and Visualization. Professor Christopher Wells. "Interactive data visualizations"

Population Health Sciences 780: Public Health: Principles and Practice. Professor Barbara Duerst. "Integrated human services data: Improving service provision for the super-utilizer population"

Water Quality and Nutrient Management

Engineering 601: Interdisciplinary Design for Energy and Sustainability. Professor Scott Williams. "Financially feasible anaerobic digesters: A proposal for Clean Fuel Partners"

Environmental Studies 402: People, Environment and Sustainability. Professor Tom Eggert. "Phosphorus management recommendations"

Environmental Studies 972: Conservation Planning. Professor Arlyne Johnson. "Conservation management plans: Door and Dorn Creek"

Library and Information Studies 640: User Experience Evaluation and Testing. Professor Kyung-Sun Kim. "Helping farmers manage nutrients: A user-experience-design analysis of SnapPlus"

Closing the Housing Gap

With its high quality of life, strong economy, low unemployment rate and good schools, Dane County regularly ranks as one of the best places in the country to live. People are taking notice—the population is growing at a faster rate than that of the State of Wisconsin.

This positive outlook has brought serious challenges too. Increasing demand for housing has raised home prices and rental rates. Coupled with rising poverty levels and growing unemployment rates among minorities, almost one-third of all households in Dane County are struggling to find safe, healthy, affordable and accessible housing. Dane County faces a large housing gap—a shortage of more than 11,000 apartments and homes at rental rates that current residents can afford.

Given these challenges, what best practices can the county employ to develop and fund sustainable, affordable housing? How can the county best match overall needs to specific locations?

To support student research, Dane County staff and UW-Madison faculty members identified 95 parcels with the potential for affordable housing developments. They looked for sites that were:

- *Already planned for high-density residential or mixed-use development*
- *Within a five-minute walk to key amenities like a bus line, job opportunities, schools, health-care facilities, grocery stores or parks*
- *In an area of high need following criteria used by the Wisconsin Housing and Economic Development Authority for its Low-Income Housing Tax Credit program*

What is a housing gap?

A housing gap is the difference between the number of housing units available at an affordable price and the number of units that are needed. When there is a housing gap, residents may live in housing they cannot afford. Or, people may live in overcrowded or substandard housing. Or, in the worst case, a housing gap can lead to homelessness.

The site of a proposed housing development in DeForest.

Guidelines for affordable and workforce housing in Dane County

How should community leaders and developers pursue constructing affordable and workforce housing? Students in Professor James LaGro's Urban Design: Theory and Practice class (Urban and Regional Planning 611) compiled best practices specific to the unique needs and demographics of Dane County's small towns and villages, small cities, central city and suburbs.

For example, students recommended municipalities create incentives for developers, update zoning, and provide down-payment and home-repair loans to homeowners. They also recommended developers work with residents to determine the appropriate services for residents, design new units in the style of the existing community to maintain neighborhood characteristics and locate projects in areas with easy access to transportation for residents.

Site analyses: values and risks

Students in Professor Jaime Luque's Urban and Regional Economics class (Real Estate 420/720) focused on creating safe, sustainable, and affordable communities for low-income families and seniors, veterans, domestic violence victims and the homeless.

Students recommended housing developments on 29 sites throughout the county, including Cambridge, Christiana, Cottage Grove, Cross Plains, DeForest, Fitchburg, Madison, McFarland, Middleton, Monona, Rutland, Stoughton, Sun Prairie, Verona and Waunakee. They found that within every community, the need for more affordable and workforce housing was strong.

Students considered future residents' needs in their recommendations. For example, on an 11-acre parcel in Waunakee, they proposed a 50-unit apartment building with affordable rents for low-income families with children. The location in a business park offered employment opportunities for parents. However, the site did not have access to public transportation for residents to access other parts of the village. For families without a car, students included a ride-sharing service. To reduce the barriers to employment, they included an on-site day care. To promote community engagement, they left part of the parcel undeveloped for future use as a green space, park or community center.

In their analysis, students also investigated the types of loans, tax credits and grants available to finance their proposed developments.

Concepts for multi-family and small-lot developments in DeForest

With increasing population numbers, a median household income of $72,000 and a median age of 35, the Village of DeForest is thriving. Like other communities across the county, that growth has led to a housing shortage for the village's residents.

Students in Professor Tom Landgraf's fall and spring Residential Property Development classes (Real Estate 611), analyzed sites in DeForest to determine what types and sizes of housing developments were feasible on parcels the city identified for residential and/or mixed-used development. Their research included specific unit sizes and features, construction timelines, sources and use of capital, cash-flow analysis, risks and rewards. In addition, students examined the surrounding neighborhoods in their proposals, giving extra points to sites that offered easy access to transportation, schools, libraries, grocery stores, health-care facilities, shopping, employment and other services.

For their development plans, students focused on multi-family buildings and small-lot homes. For example, a proposal included:

- *Transforming a 1.61 acre lot with a 40-unit apartment building featuring two and three-bedroom apartments. To keep housing affordable for DeForest residents, rent prices would range from $728 to $1,400.*

Students designed housing developments in DeForest to elevate the aesthetics, character and quality-of-life of the surrounding neighborhoods.

Housing for aging residents: proposals for DeForest and Windsor

Residential-health housing provides in-home care for individuals as they age. These facilities feature multiple levels of aid, including independent living, assisted living, memory care and skilled nursing. Students in Professor Tom Landgraf's Residential Health class (Real Estate 365/765) assessed the need for future residential-health housing developments in DeForest and Windsor. They analyzed demographic trends and inventoried current housing options. With almost 5,000 residents at or approaching retirement age by 2030, the students found a notable deficiency in affordable, independent living options for seniors. They proposed two housing developments.

- *A 40-unit building would cater to local seniors downsizing from their single-family homes. It would also feature assisted living and memory care services in the same complex so residents could transition easily to higher levels of care if needed.*
- *A 55-unit, independent-living structure would feature commercial space for a coffee shop or similar business to allow residents to remain connected to the greater community.*

Designing distinctive communities

Gaining public support for affordable and workforce housing developments in a community can be challenging. Students in Professor James LaGro's Housing and Urban Design class (Landscape Architecture 351) demonstrated that site design matters.

Building on feasibility studies from other UW-Madison classes, students further analyzed parcels in DeForest, Middleton, Mount Horeb and Fitchburg. They then designed distinctive and attractive affordable housing developments that elevate the aesthetics, character and quality-of-life of the surrounding neighborhood.

For example, a proposal for modular apartments also featured green roofs, skylights and vibrant colors to give a modern vibe to the site. A concept for tiny houses included community gardens and an organic swimming pond (complete with plants that filter the water) to bring the beauty of the outdoors to the middle of the city. Additionally, a design featuring townhomes incorporated shared green spaces and an extensive system of walking paths to encourage a healthy, active lifestyle while linking the neighborhood to the surrounding community.

Housing needs assessment

Much of students' research on housing in Dane County cited Professor Kurt Paulsen's influential 2015 report, "Housing Needs Assessment: Dane County and Municipalities." Students in his Housing and Public Policy class (Urban and Regional Planning 844) conducted additional research to revise the data and bring the report up to date.

Students found that Dane County still faces an extreme shortage of affordable housing for its growing population.

Impact analysis of sustainable home systems and features

Distinctive homes go beyond appearance. They also include high-quality, energy-efficient and sustainable features that improve the functionality of the home behind the scenes. Students in Professor Andrea Hicks's Environmental Sustainability Engineering class (Civil Engineering 421) used the three paradigms of sustainability—environmental, economic and social impacts—to compare and recommend building systems and technologies to use in new home construction or redevelopment projects. For example, students found that:

Windows with "low solar gain (LSG) low-e coating is favorable for the type of climate found in Dane County, as it reduces the amount of solar heat that travels through the window by just enough, allowing an interior space to heat up slightly from the sun in winter months but stay much cooler in summer months. An LSG low-e coated, triple-glazed window with a non-metal frame and argon gas fill is the best option considering capital costs, net savings and environmental and social benefits."

Other sustainable recommendations included:

- *Geothermal heating systems*
- *Recycled-denim insulation*
- *Light-emitting diode (LED) light bulbs*
- *Passive housing design to minimize heat loss or gain, depending on the season*
- *Solar panels*

Solar energy considerations for residential and commercial properties

Solar panel technology has matured. The quality and efficiency of the systems have improved, while installation costs have decreased. In Dane County, solar panels are becoming a more common sight on residential and commercial properties. Students in Professor Tom Landgraf's Green Sustainable Development class (Real Estate 651) investigated financing options for property owners to install solar panels.

Students found that federal tax credits, capital leases, traditional lending and private capital are common funding sources. Solar installation projects are unique—costs and paybacks are determined by the specifications of each project. All installations bring reduced energy costs (after a payback period) and offset greenhouse gas emissions associated with traditional energy production.

Economic Development

Dane County has a better-than-average unemployment rate of under three percent. However, among minority residents, the unemployment rate hovers around 22% to 26%. Meanwhile, local employers with job openings report having a difficult time finding qualified applicants.

What best practices in economic development could Dane County implement to prepare the workforce, support entrepreneurship, and mitigate barriers to employment while advancing its racial equity, social equity and sustainability priorities?

Downtown Cambridge remains a hot spot for potters, artisans and creatives of all types.

"Overall, the cooperative model should be chosen when potential members benefit the most, and it is the most efficient business model."

—Students in the Cooperatives class

Cooperatives build a stronger, more resilient workforce

In Wisconsin, childcare costs range from $8,000 to $11,000 annually. That high price tag prevents some parents from joining the workforce—they simply cannot afford to get a job and pay for childcare to keep that job. Meanwhile, businesses can suffer from absenteeism and retention when employees cannot find reliable, quality care for their children.

Students in Professors Anne Reynolds's and Courtney Berner's Cooperatives class (Agricultural and Applied Economics 323) researched whether childcare cooperatives could offer parents a better alternative to traditional day care centers. They assembled case studies from across the country to recommend three cooperative models with viability for Dane County.

Parent-owned cooperatives engage parents in running the cooperative and providing care for the children. Worker-owned cooperatives employ experienced providers to care for the children. Business-owned cooperatives are run by a consortium of companies to provide childcare for their employees.

All childcare cooperatives offered excellent care at more affordable costs. Students found the worker-owned and parent-owned modules most feasible for Dane County.

Providing resources and creating opportunities for all residents

Dane County owns and operates the Alliant Energy Center. The site regularly hosts local, national and international conventions, concerts, sporting events, festivals, meetings, trade shows and more. However, when not hosting an event, much of the site is unoccupied, including the vast parking lot. Meanwhile, the surrounding area is home to a large, diverse, lower-income population in need of employment opportunities.

Students in Professor Tom Eggert's People, Environment and Sustainability class (Environmental Studies 402) investigated how residents near the Alliant Energy Center could make use of its ample space. They recommended the county organize a pop-up retail market in the center's parking lot to support entrepreneurs in the neighborhood.

Similar to events like the Madison Night Market, pop-up markets feature temporary, movable structures, like tents or shipping containers. With minimal startup costs, risks or long-term commitments, pop-up markets allow entrepreneurs to try out business ideas, test new products and create brand awareness.

Students researched successful pop-up markets in New York City, Los Angeles, Salt Lake City, Washington, D.C. and Bangkok. They also gleaned best practices from two events on the capitol square in Madison: the Dane County Farmers' Market and Taste of Madison. Additionally, they reviewed how the World Dairy Expo and Brat Fest use the Alliant Energy Center facilities and grounds for large, public events.

With this research in mind, students recommended events, administrative structures, application processes, and plans for infrastructure, advertising and evaluation. For example, a cultural event could celebrate the heritage of the residents who live near the Alliant Energy Center while featuring local cuisine, home goods and artisan merchandise.

Additionally, students recommended locating the market in the north east parking lot because of its visibility from Rimrock Road and John Nolan Drive. Options to track attendance, including motion detectors, Wi-Fi analytics and drones, were also provided.

Students proposed using the vast Alliant Energy Center parking lot for pop-up markets featuring local entrepreneurs.

Frequent Users of County Services

A person with four jail and four shelter admissions in the last five years. A person with a serious mental-health diagnosis and two or more hospitalizations in a 12-month period. These individuals who repeatedly cycle through multiple criminal justice and social service agencies are described as “frequent users” or “super utilizers” of county services.

Frequent users require specialized, complex and costly care. Fortunately, high-quality service providers are easy to find in Dane County. Yet the individualized care they offer doesn’t go far enough. Frequent users require coordinated care amongst multiple providers, as well as the systems, policies and processes that advance the providers’ efforts. It’s a tall task for an already-constrained county budget.

Communities across the United States facing similar challenges have found solutions in data-analysis approaches. For example, using data to identify vulnerable individuals before they face a crisis—and providing timely and targeted resources—has prevented individuals from ever reaching super-utilizer status.

Given these challenges and opportunities, how can the county use data to provide frequent users of county services and other vulnerable residents with more comprehensive and cost-effective care?

More coordinated care would benefit seniors who rely on a variety of county services.

Integrated human services data: Improving service provision for the super-utilizer population

Students in Professor Barbara Duerst's Public Health: Principles and Practice class (Population Health 780) investigated how consolidating administrative and programmatic data into one system can better serve residents. Through case study research, they found that deploying an Integrated Data System (IDS) requires money, time and commitment, yet the results are worth it.

For example, Michigan integrated its data across many departments at the state level. It estimated having saved $800 million while improving health outcomes. In one instance, officials analyzed data to identify 14 communities with 80% of all childhood lead-poisoning cases. In response, the state targeted its intervention efforts to these specific communities. As a result, childhood lead poisoning decreased by 35%.

Other communities also reported increased efficiency, capacity, accountability and inter-organizational collaboration as a result of integrating data across agencies and departments.

As one can imagine, implementing an IDS was complicated for these communities. The initial infrastructure costs ranged from $50,000 to $800,000. Municipalities found federal and private grants to offset costs. Maintenance funds were also needed, which were offset by significant cost savings from implementing the system. Technical expertise, security concerns, legal issues and organizational culture were also seen as barriers. Undertaking such a project required persistence, commitment and strong leadership at multiple levels of government.

Program development plan

Dane County offers a voluntary, community-based program for adults and children struggling with mental health or substance abuse issues. The Comprehensive Community Services (CCS) program assists more than 600 clients per year through a network of 75 agencies.

Two CCS program staff attended the UW-Madison Global Health Institute's annual Quality Improvement Leadership Institute to learn the principles of quality improvement, develop leadership skills, and design plans to improve health and wellbeing. Staff focused on gathering and analyzing data to ensure clients' recovery plans include well-defined goals, identify specific actions to achieve goals and quantify how progress will be measured.

"The challenges of IDS implementation may seem daunting; however, integration of human services data has the potential to promote highly coordinated services, decrease costs, improve efficiency, and promote collaboration and innovation. Ultimately, successful IDS projects can improve the lives and health outcomes of both the super-utilizer population and the community as a whole. Furthermore, if the challenges to IDS implementation can be navigated successfully, Dane County could serve as a pilot for future IDS projects, laying the groundwork and providing a roadmap that can be applied throughout the state."

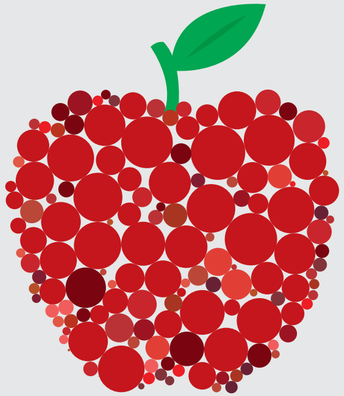
—Students in the Public Health: Principles and Practice class

Interactive data visualizations

Students in Professor Christopher Wells's Concepts and Tools for Data Analysis and Visualization class (Journalism 677) created interactive data visualizations to help the county analyze massive amounts of already available, public data. The visualizations showed which residents have the greatest need, where they were located and whether they had sufficient access to services.

Students analyzed data about free and reduced lunches in schools, homelessness, housing affordability, home care placements for children, maltreatment trends, child victimization, juvenile court programs and service providers.

Featuring multiple charts, users can easily dig deep into the data. What school in the county has the most children eligible for free and reduced lunch? Are there comprehensive care service providers located near that school? Explore the visualizations online (univerCity.wisc.edu/visualizations) to find answers to these and other pressing questions.



What school has the greatest need?

UW-Madison students analyzed data to determine which parts of the county have families most in need of help. One common metric, visualized here, is the percentage of students in each Dane County school eligible for free and reduced lunch.

Dane County school districts

- *Madison Metropolitan*
- *Belleville*
- *Cambridge*
- *DeForest Area*
- *Deerfield Community*
- *Marshall*
- *McFarland*
- *Middleton-Cross Plains Area*
- *Monona Grove*
- *Mount Horeb Area*
- *Oregon*
- *Stoughton Area*
- *Sun Prairie Area*
- *Verona Area*
- *Waunakee Community*
- *Wisconsin Heights*

Water Quality and Nutrient Management

The lakes are the crown jewels of Dane County—central to the county's character, economy and quality of life. Public support for clean lakes and waterways runs wide and deep, yet the quality of the lakes and streams regularly falls short of federal standards.

Excess phosphorus runoff, and the resulting algal blooms on the lakes and waterways, remains a key concern. Like a mat floating on top of the lake, algal blooms limit the amount of sun and oxygen available to plants and animals. Fish die. Plants die. And people and pets exposed to algae can become seriously ill.

Rapid urban growth is accelerating phosphorus, nitrates, sediment and other pollution runoff to the lakes and waterways. Dane County is increasing its population by about 60,000 people every 10 years, and development has converted many farms, forests and wetlands to hard-surface urban and suburban uses.

Farms make up more than half of Dane County and are essential to the county's economic stability and continued growth. Today's farmers produce more food on less land, at lower cost, with higher nutrient inputs. Additionally, livestock operations in Dane County's watersheds are expanding rapidly, creating greater concentrations of manure. Without careful management, intensified livestock and crop production can increase phosphorus, nitrates and sediment runoff.

Given these challenges, what practices, policies or procedures could Dane County implement to reduce nutrients in the lakes and waterways and improve the overall quality of these critical resources?

One conservation management plan focuses on improving Dorn Creek, an impaired waterway that flows into Lake Mendota.

Conservation management plans for Door and Dorn Creek

Students in Professor Arlyne Johnson's Conservation Planning class (Environmental Studies 972) tackled improving the water quality of two impaired creeks. Both creeks are located near agricultural land and are threatened by high amounts of phosphorus.

Door Creek is a tributary to the Yahara River that extends from the northeast edge of Madison and flows 12 miles south to Lake Kegonsa. It is part of the Door Creek watershed, which is made up of approximately 20,500 acres of land and water.

Dorn Creek is a tributary to Six Mile Creek located in the northwest part of the county. It starts in Springfield and flows into Lake Mendota near Governor Nelson State Park.

Students developed detailed multi-year plans for each creek. Some of their key recommendations included increasing the size and use of riparian buffers along the creeks, implementing conservation practices near the creeks and increasing the number of farms with formal nutrient management plans.

Riparian buffer zones are areas along the water covered with plants and grasses. These buffer zones filter out phosphorus and nitrogen from runoff into the water. They also reduce erosion by locking soil in place. Additionally, they are home to native wildlife and plant species and increase the biodiversity of the area, an indication of a healthy ecosystem. Not only are buffer zones aesthetically pleasing, farmers can harvest certain crops in this area between their agricultural fields and the creeks, giving farmers the option to use the land while protecting the quality of nearby waterways.

Farmers are often the first to implement conservation management practices. For example, there are more than 35 techniques already in place in the Dorn Creek watershed. Some of these measures include planting trees and shrubs with a high capacity to absorb nutrients; grazing animals on pasture to reduce manure handling, storage and spreading; and building trails and walkways to divert animals from ecologically sensitive areas. Students recommended continued outreach and education efforts so landowners are aware of all the conservation options available to them.

For information about nutrient management plans, see page 31.

An "impaired" designation means that levels of one or more pollutants are affecting Dorn Creek's ability to meet its designated use.

By sending manure to a digester, instead of spreading it on the fields, this Dane County farm helps reduce the amount of nutrients running off into the waterways.

Financially feasible anaerobic digesters: a proposal for Clean Fuel Partners

When farmers spread excess manure on their fields, nutrients can run off into the lakes and waterways, leading to algal blooms and otherwise adversely affecting water quality. Enter anaerobic digesters. These facilities take the manure from farms and convert it into biogas for various uses.

Students in Professor Scott Williams's Interdisciplinary Design for Energy and Sustainability class (Engineering 601) collaborated with Clean Fuel Partners to study operations at its digester facility in the Village of Dane. To ensure operating the digester remained financially feasible, students recommended turning the resulting fiber byproduct into pellet-shaped fertilizer and readying the biogas for injection directly into the natural gas pipeline.

Helping farmers manage nutrients: A user-experience design analysis of SnapPlus

Nutrient management plans guide farmers in implementing best practices for how, when and where to apply manure or commercial fertilizers (nutrients) to their fields. Most farmers have some sort of nutrient management plan, and Wisconsin Code requires others to have official plans on record. Plans are encouraged for all farms to keep nutrients on the fields where they are needed and prevent nutrients from running off into the lakes and waterways.

Writing nutrient management plans can cost money, involve a steep learning curve and can take a considerable amount of time. To assist farmers in the process, the University of Wisconsin-Madison and its partners developed SnapPlus (Soil Nutrient Application Planner). The free computer program uses data to calculate how much of any nutrient to apply to a field. It also assesses potential runoff and determines the financial costs of applying manure and commercial fertilizers.

Students in Professor Kyung-Sun Kim's User Experience Evaluation and Testing class (Library and Information Studies 640) investigated whether SnapPlus was easy for farmers to use. They researched ways to improve the program's usability and to streamline how users navigate the program.

Testing with mock users found the program to be quite useful overall. Some recommended improvements involved aesthetics, like adding clearer labels and increasing font sizes. Other recommendations included incorporating the numerous beneficial SnapPlus training materials into the program itself. Students also proposed a mobile-accessible version of the program to accommodate farmers who are out in the fields and other on-the-go users. Finally, students recommended conducting further testing with more experienced SnapPlus users to gain additional feedback.

Best practices in phosphorus management

Students in Professor Tom Eggert's People, Environment and Sustainability class (Environmental Studies 402) studied how local governments around the country and the world have implemented best practices in phosphorus management.

Research showed that a 50-feet-wide riparian buffer zone can prevent up to 95% of sediment deposit. In response, Minnesota mandated buffer zones of at least 30-feet wide and an average of 50-feet wide.

Finding alternative uses for manure was also a common practice, and some states provided funding for the effort. For example, Maryland levied taxes for a manure-transport program to offset some costs associated with handling, loading and transporting manure from farms with excess manure to those that can use it.

Other phosphorus-management strategies included removing existing phosphorus from impaired waterways. One technique trialled in 114 lakes across the United States and Europe involved using non-toxic chemicals to bind with the phosphorus. As a result, the amount of total phosphorus decreased and water quality improved.

Improving water quality across Dane County requires a multilevel, collaborative approach. Digester facilities (top left) and conservation management practices can help improve places like Lake Mendota (top right), Door Creek, the Yahara River (bottom left) and Dorn Creek (middle left). Urban residents and property developers must also play a role in reducing impact on the waterways and protecting and preserving these environmental assets for current and future Dane County residents.

Work with the UniverCity Alliance

UniverCity Alliance is a network of UW-Madison faculty and staff interested in connecting their teaching and research to the perspectives of local leaders and the challenges they face. Through education, outreach and technical assistance, the Alliance focuses on improving the sustainability, resilience, livability and general wellbeing of communities throughout Wisconsin and the world. These partnerships also enhance the community's workforce pipeline and make UW-Madison's curriculum, research and training more relevant to students and faculty.

UniverCity Alliance programs include:

- *Technical Assistance, a short-term engagement to connect faculty and staff expert advice, research and action to locally-defined projects. (Communities in need of technical assistance should contact Gavin Luter, UniverCity Alliance director, at gavin@cows.org or 608.261.1141.)*
- *MetroLab Madison, a long-term commitment to the City of Madison to better and more strategically connect the university with the city we call home.*
- *UniverCity Year, an intensive, three-year partnership with local governments across Wisconsin to plan, research and implement community-identified projects.*

UniverCity Year

UniverCity Year accepts requests for proposals from local governments interested in working with UW-Madison to reexamine long-standing practices, ask tough questions, engage residents and ignite sustainable growth.

Proposals describe the issues facing the community and the anticipated student deliverables. For example, in the last two years, students have produced:

- *Landscape architecture designs and turf-management plans for parks, schools and other public spaces*
- *Cost-benefit analysis of implementing public, city-wide Wi-Fi*
- *Public service announcements to play on community radio stations*
- *Native American cultural preservation plans for city parks*
- *Conservation management plans to improve water quality*
- *User-experience testing of websites and software programs*
- *Affordable housing analysis and development proposals*
- *Transportation plans to make walking and biking to school safer for students and parents*
- *Community health plans to streamline care across multiple agencies*
- *Communication plans to improve leaf-management practices*

For more information about the request for proposal process, please visit our website at univerCity.wisc.edu or email our staff at univerCityalliance@wisc.edu.

Dorn Creek runs along farmland in Dane County.

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