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1	2014	Sec 8	Minnesota Invasive Terrestrial Plants and Pests Center	U of MN - MITPPC	Robert Venette	$ 1,460,000	Funding enabled the establishment of the Minnesota Invasive Terrestrial Plants & Pests Center (MITPPC). MITPPC now drives discoveries to prevent or reduce threats posed by priority invasive species to Minnesota lands. We bring University-of-Minnesota researchers together with partners from around the state, taking a programmatic approach to make thoughtful research investments and solve complex problems.
2	2015	06a-01	Sub-Project 01: Garlic Mustard Biocontrol: Ecological Host Range of Biocontrol Agents	U of MN - MITPPC	Roger Becker	$ 600,000	We were integral in the release of Ceutorhynchus scrobicollis in Canada, the first biological control agent for garlic mustard in North America. We moved closer to federal regulatory approval to release C. scrobicollis and C. constrictus in the United States. When achieved, these will offer the first viable control of garlic mustard in Minnesota woodlands.
3	2015	06a-02	Sub-Project 02: Mountain Pine Beetle, Phase II: Protecting Minnesota	U of MN - MITPPC	Brian Aukema	$ 444,982	Repeated surveys did not find mountain pine beetle in Minnesota. Scant few individuals were captured dispersing far from active infestations in western states. We found that local bark beetles and predators do not optimally recognize the insect's chemical signals, however, suggesting that such components of invasion resistance might be low.
4	2015	06a-05	Sub-Project 05: Optimizing Tree Injections against Emerald Ash Borer	U of MN - MITPPC	Brian Aukema	$ 318,927	Emerald ash borer continues to spread and devastate Minnesota's urban forests, but deploying the right types of insecticides to ash trees in the right ways can offer tree conservation and protection with minimal risk to non-target organisms such as bees that visit flowers and worms that decompose leaves.
5	2015	06a-06	Sub-Project 06: Distribution and Traits of the Fungal Pathogen Fusarium Virguliforme that Influence Current and Future Risk to Soybean and Other Legumes in Minnesota	U of MN - MITPPC	Dean Malvick	$ 383,651	This project has discovered factors that influence the ability of the fungus Fusarium virguliforme to become established as a destructive pathogen on crops in new areas of Minnesota. The results are foundational to understanding this pathogen and contribute to managing the diseases it causes on soybean and other crops.
6	2015	06a-07	Sub-Project 07: Tools to Distinguish Native from Exotic Reed Canary Grass	U of MN - MITPPC	Neil O. Anderson	$ 263,273	This project used genetic techniques to find that most reed canarygrass in Minnesota is native to the state and not from Europe. Plant DNA was extracted from samples of reed canarygrass across the state. Due to this outcome, Tribal and State managers may choose to manage or preserve this species differently.

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7	2015	06a-08	Sub-Project #8. Accurate detection and integrated treatment of oak wilt (Bretziella fagacearum) in Minnesota	U of MN - MITPPC	Jeannine Cavender-Bares	$ 356,382	This project developed methods and approaches for better detection of oak wilt using spectroscopic technology and documented best practices to prevent spread of the disease.
8	2015	06a-10	Sub-Project 10: Management Strategies for the Invasive Spotted Wing Drosophila	U of MN - MITPPC	Mary Rogers	$ 477,541	Our project developed new cost-effective methods to help growers manage damage and reduce yield loss caused by the invasive Spotted-wing drosophila in small fruit while reducing pesticide use. Additionally, we have gained basic knowledge on the behavior and flight capabilities of this pest that will contribute to future management strategies.
9	2015	06a-11	Sub-project 11: Will Future Weather Favor Minnesota's Woody Invaders?	U of MN - MITPPC	Peter Reich	$ 526,000	Our findings tell the story of how exotic honeysuckle and buckthorn have invaded Minnesota forests, how and why new areas are likely to be invaded in the future, and how we may be able to mitigate invasion using native tree species.
10	2016	06a-01	MITPPC - Phase III - Fungi in Ash Trees: Towards Protecting Trees from Emerald Ash Borer and New Diseases	U of MN	Robert Blanchette	$ 500,000	Important new findings have been obtained about the fungi associated with the emerald ash borer (EAB). This knowledge helps better understand the biology and ecology of EAB invasion and provides new biological control agents that can be used to help manage this invasive pest.
11	2016	06a-02	MITPPC - Phase III - Understanding the Benefits and Limitations of Using Goats for Invasive Plant Control	U of MN	Tiffany Wolf	$ 445,533	Targeted grazing by goats demonstrates some benefits for the control of invasive Rhamnus cathartica and the enhancement of native plant communities. While P. tenuis transmission to goats remains a concern during invasive plant management, co-grazing goats with waterfowl may mitigate this seasonal disease risk.
12	2016	09g	Otter Tail River Recreational Trail Acquisition	City of Fergus Falls	Andrew Bremseth	$ 600,000	The City of Fergus Falls proposed, but was unable, to acquire 3,476 lineal feet of frontage on the Otter Tail River.
13	2017	05b	Increasing Diversity in Environmental Careers	MN DNR	Mimi Daniel	$ 487,000	The Increasing Diversity in Environmental Careers (IDEC) program fosters the next generation of environmental and natural resources professionals and enthusiasts. From 2019 to 2022, 32 students enrolled in the IDEC program learned about and gained hands-on experience in the environmental/natural resources field. As a result, as these students become professionals, they will bring diversity and innovation to natural resources management and conservation.

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14	2017	05c	Interactive Water Resource Programs for Planetariums in Minnesota	U of MN - Bell Museum of Natural History	Sally Brummel	$ 500,000	Water flows out of Minnesota in three directions and our personal and public choices have impacts far beyond our borders. With Minnesota Water Stories, citizens tour Minnesota in planetariums across the state, to learn about issues in each region and understand what they can do to protect this natural resource.
15	2017	06a	Aquatic Invasive Species Research Center - Phase II	U of MN - MAISRC	Nicholas Phelps	$ 2,700,000	This project continued MAISRC's work to develop research-based solutions that can reduce the impacts of aquatic invasive species in Minnesota. Through this appropriation, MAISRC has supported 15 subprojects on many of Minnesota's most important AIS, significantly advanced our scientific understanding and ability to manage AIS, and engaged thousands of stakeholders and partners.
16	2017	08d	State Park Pollinator Habitat Restoration	MN DNR	Edward Quinn	$ 672,000	This project restored approximately 520 acres of prairie/pollinator habitat in eight state parks where it will be permanently managed and protected. Additionally, educational pollinator plantings ranging in size from tenths of an acre to more than an acre were installed with engaging multi-sensory ADA-accessible interpretive exhibits at ten state parks.
17	2017	08j	Economic Assessment of Precision Conservation and Agriculture	Pheasants Forever Inc	Tanner Bruse	$ 400,000	This project showcased opportunities available for farmers and landowners to implement profitable conservation practices on lands otherwise providing a negative return. Through this new approach to conservation delivery, we were able to put 1,216 acres of conservation on the landscape, providing multiple benefits to Minnesota's natural resources and economy.
18	2017	09b	Scientific and Natural Areas Acquisition, Restoration, Citizen Science and Engagement	MN DNR	Molly Roske	$ 2,500,000	Volunteers, staff, and contractors with Minnesota DNR completed enhancement and improvement activities on almost two-thousand acres of quality habitat on 75 of Minnesota's SNAs. A 10-acre wetland acquisition was added to Hastings SNA. Many thousands more people learned about, visited, or helped steward an SNA thanks to this funding.
19	2017	09e	Native Prairie Stewardship and Prairie Bank Easement Acquisition	MN DNR	Judy Schulte	$ 2,675,000	Permanently protected 287 acres of high-quality historically undisturbed native prairie, which house state threatened and special concerns species, Species in Greatest Conservation Need, and a wide variety of pollinators. Prairie enhancement (1,227 acres), outreach, monitoring and research activities were implemented across the state to improve prairie habitat.

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20	2017	09g	Mesabi Trail Development	St. Louis & Lake Counties Regional Railroad Authority	Bob Manzoline	$ 2,269,000	This project was an important part of nearing the completion of a planned 162 mile long paved bicycle trail stretching from Grand Rapids to Ely, MN. The ENRTF funding along with other funds allowed for the completion of the T.H. 135 to Embarrass and Soudan to Vermilion State Park Entrance Road segments of the Mesabi Trail and for the near completion of the McKinley to Biwabik segment. Final work on this segment will be completed with ML 2021 ENRTF funds.
21	2018	03c	Minnesota Biodiversity Atlas - Phase 2	U of MN - Bell Museum of Natural History	George Weiblen	$ 350,000	The Minnesota Biodiversity Atlas provides online access to 150 years' of natural history information by integrating and disseminating data from state agencies, museums, colleges, and universities. It enables the general public, natural resource managers, educators' and researchers to investigate past and present biodiversity patterns and make predictions about future directions.
22	2018	03d	Peatland Forest Management	U of MN	Marcella Windmuller-Campione	$ 600,000	Forty-eight peatlands sites have been monitored for four years providing critical new information on hydrology during wet and dry years, boreal chickadee breeding habitats (some of the first data of its kind), and plant diversity. Data show regeneration harvests do not significantly impact the water table and vegetation responds quickly.
23	2018	03e	Assessing Natural Resource Benefits Provided by Lichens and Mosses	U of MN	Daniel Stanton	$ 213,000	We documented the potential impact of moss and lichen on the flow of water and pollutants through Minnesota forests. This impact varies across the state depending on the forest type but can reach >15% of each rain event. Pollutant filtering effects are smaller, but not unimportant.
24	2018	03g	Conserving Minnesota's Forest Birds of Management Concern	U of MN - Duluth NRRI	Alexis Grinde	$ 500,000	Golden-winged Warbler, Veery, and American Woodcock are species of conservation concern in Minnesota and have had significant population declines throughout their breeding ranges. We documented nest success and used radio-telemetry to study juvenile survival to identify habitat characteristics and management actions that maximize productivity and inform conservation efforts.

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25	2018	03k	Conserving Minnesota's Nine Species of Freshwater Turtles	Minnesota Zoo	Seth Stapleton	$ 300,000	The Minnesota Zoo conducted research and implemented conservation actions including nest site protection and head-starting to bolster wood turtle populations. We studied methods to mitigate road mortality of turtles, with results suggesting that simple tube barriers may be effective. Our outreach efforts raised awareness and encouraged action to benefit conservation.
26	2018	04b	Assess and Develop Strategies to Remove Microscopic Plastic-Particle Pollution from Minnesota Water Bodies	U of MN	Lian Shen	$ 300,000	We performed a comprehensive study on the motions of microscopic plastic-particle in water flows. Extensive experiments utilizing innovative imaging techniques on laboratory apparatuses, assisted by state-of-the-art simulations on supercomputers, have been conducted. Valuable data have been collected and analyzed for addressing the plastic pollution in Minnesota water bodies.
27	2018	04c	Reduce Chlorides in Minnesota Waters by Evaluating Road-Salt Alternatives and Pavement Innovations	U of MN	John Gulliver	$ 400,000	This project produced background information, guidance and recommendations on the benefits and consequences of chloride-based road salt and non-chloride alternatives for de-icing and anti-icing Minnesota's roadways. With these guidance and recommendations road maintenance decisions makers can reduce pollution from winter road management.
28	2018	04d	Protect Water Quality with Efficient Removal of Contaminants in Treatment Ponds for Storm Water	St. Cloud State University	Heiko Schoenfuss	$ 325,000	Our study demonstrates that pharmaceuticals and pesticides are commonly found in urban stormwater and can impact aquatic life. Stormwater ponds, especially when augmented with iron-enhanced sand filtration, can often reduce these pollutants, and lessen their impact on Minnesota aquatic environments.
29	2018	04e	Develop Small and Inexpensive Purification System for Community Drinking Water	U of MN	Tianhong Cui	$ 425,000	This project designed a small water purification system for drinking water that can simultaneously remove the organic pollutants and heavy metal ions in the water. The system can be connected either to domestic drinking water taps or to water in lakes and rivers.
30	2018	04f	Evaluate Emerging Pathogens in Lakes, Rivers, and Tap Water to Keep Drinking Water Safe	U of MN	Timothy LaPara	$ 325,000	Seven full-scale drinking water systems were investigated for the presence of Legionella and Mycobacteria, opportunistic bacterial pathogens of health concern. This research demonstrates these organisms are commonly found in drinking water during the late summer/early fall; water utilities are encouraged to sustain a residual disinfectant to help suppress these pathogens.

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31	2018	04g	Characterize Unregulated Contaminants in Source Water and Drinking Water	Minnesota Department of Health	Stephen Robertson	$ 1,000,000	Analysis of drinking water resources reveals the presence of a range of unregulated contaminants at low levels. Most of these levels are below health-based guidance, if available. Results are being used to inform development of new health-based guidance and to perpetuate drinking water ambient monitoring. (Final product pending remediation.)
32	2018	04h	Mapping Antibiotic Resistance in Minnesota to Help Protect Environmental, Animal, and Human Health	U of MN	Randall Singer	$ 750,000	Our project mapped and quantified antibiotics and antibiotic resistance genes in Minnesota waters and soils. These findings are now used to target hotspots to better understand their fate and transformation in waterbodies. Ultimately, this information will be used for AMR mitigation strategies to protect environmental, human, and animal health.
33	2018	04i	Farmer-Led Expansion of Alfalfa Production to Increase Water Protection	U of MN	Nicholas Jordan	$ 500,000	Farmers working together in watersheds can build the base of supply chains for new crops that provide continuous living cover of farmland, thereby providing healthy soil, clean water, and abundant wildlife. These supply chains will meet demand for sustainably produced commodities, providing a market-driven pathway to clean water.
34	2018	05d	Connecting Students with Water Stewardship through Hands-on Learning	Minnesota Trout Unlimited	John Lenczewski	$ 400,000	This project connected approximately 10,000 Minnesota youth with their local watersheds. Through a combination of habitat site explorations, field studies, classroom learning, and outdoor recreation, students gained an appreciation for the natural world and understanding of how their decisions can positively impact water quality and watershed health.
35	2018	05f	Pollinator Ambassadors Program for Gardens	U of MN	Elaine Evans	$ 250,000	The Pollinator Ambassadors for Gardens program broadened pollinator education access across Minnesota, particularly to traditionally underserved audiences, through training 43 youth Pollinator Ambassadors and distributing 250 Pollinator Education Toolkits. Broader adoption of pollinator conservation action-steps will help Minnesotans conserve pollinator diversity, which will support food production, water quality, and healthy ecosystems.
36	2018	05g	Morris Prairie Pollinator Demonstration Area and Education	U of MN - WCROC	Lee Johnston	$ 550,000	This project restored 17 acres to a native prairie habitat to enhance the local ecosystem for beneficial pollinators and native species of plants. The project site also provides educational opportunities for visitors on how to protect or enhance native habitats and beneficial pollinators.

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37	2018	06b	Palmer Amaranth Detection and Eradication Continuation	Minnesota Department of Agriculture	Monika Chandler	$ 431,000	Palmer amaranth is an aggressive weed that is expensive and damaging to control. It was found as a contaminant in a small number of conservation planting seed mixes sold in Minnesota. Rapid response to the situation resulted in Palmer amaranth eradication from impacted conservation plantings.
38	2018	06c	Evaluate Control Methods for Invasive Hybrid Cattails	Voyageurs National Park	Steve Windels	$ 131,000	Invasive hybrid cattails can be effectively controlled by mechanical treatments, creating space for native plants like wild rice and other native aquatic plants, and enhancing habitat for wetland-loving wildlife like muskrats, mink, otters, bitterns, rails, grebes, and more.
39	2018	06f	Determining Risk of a Toxic Alga in Minnesota Lakes	Science Museum of Minnesota - St. Croix Research Station	Adam Heathcote	$ 200,000	This project produced the first systematic survey of Minnesota's Sentinel Lakes for the toxic invasive algae Cylindrospermopsis raciborskii (Cylindro). Cylindro was contained to the 2 lakes where it was initially found and did not produce toxins in measurable amounts. Sediment records indicated that Cylindro has appeared in the last 10 years and has not spread statewide.
40	2018	07a	Develop Solar Window Concentrators for Electricity	U of MN	Uwe Kortshagen	$ 350,000	This project demonstrated the potential of semi-transparent "solar windows" based on silicon nanocrystals to produce carbon-free, renewable electricity. Greenhouses were identified as an attractive application. As greenhouses are becoming more widespread in Minnesota, this project will contribute to reducing their environmental footprint in terms of energy and water usage.
41	2018	07b	Demonstrations for Community-Scale Storage System for Renewable Energy	U of MN - I on E	Melissa Kenney	$ 550,000	The University of Minnesota's Institute on the Environment with Renewable Energy Partners, Red Lake Tribal Government Center, and University of Minnesota-Morris, demonstrated community-scale storage for renewable energy, including microgrids and battery systems. This project expanded our knowledge of leading-edge technology, shared lessons learned on battery acquisition, permitting, and installation, and advanced energy justice.
42	2018	07c	Develop Inexpensive Energy from Simple Roll-to-Roll Manufacturing	U of MN	Tianhong Cui	$ 300,000	Perovskite solar cells and modules were fabricated via two-step deposition method, hybrid chemical vapor deposition and air blade deposition, to produce electricity from free clean solar energy which reduced dependency on non-renewable energy usage and provides healthy environment and habitats for both residents and wildlife of Minnesota.

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43	2018	08b	Develop BioMulch to Replace Plastic Soil Covering in Vegetable and Fruit Production to Increase Yield and Reduce Waste	U of MN - Lamberton	Paulo Pagliari	$ 310,000	This project was used to develop a biodegradable product that can be used to replace plastic mulch used in vegetable production. The results of research showed that the current formulation of BioMulch worked as expected for watermelon and zucchini; and underperformed (yield was reduced) for tomatoes, peppers, and strawberry.
44	2018	08c	Develop Market-Based Alternatives for Perennial Crops to Benefit Water Quality and Wildlife	Science Museum of Minnesota - St. Croix Research Station	Jason Ulrich	$ 150,000	The project researched using different types of market incentives to develop policies and programs to fund putting more perennial lands in Minnesota's agricultural areas to benefit water quality and wildlife habitat.
45	2018	08d	Agricultural Weed Control Using Autonomous Mowers	U of MN - Morris	Eric Buchanan	$ 750,000	An autonomous electric mower, along with a solar powered charging trailer, was successfully developed and demonstrated to control weeds in cow pastures. The "Cowbot" eliminates the need for pesticides in conventional pastures and provides a carbon-free solution for organic pastures.
46	2018	08f	Develop Strategies for Timber Harvest to Minimize Soil Impacts to Maintain Healthy and Diverse Forests	U of MN	Charles Blinn	$ 200,000	Reduced snowfall predicted with climate change is likely to increase the amount of soil frost during winter, increasing the times when forest harvesting can safely occur. We developed tools that will allow managers to predict when and where optimal soil conditions occur to minimize impacts of forest harvesting.
47	2018	08g	Restoring Wetland Invertebrates to Revive Wildlife Habitat	MN DNR	Megan Fitzpatrick	$ 400,000	Our research showed amphipods are particularly sensitive to their wetland environments. High abundances of amphipods useful as wildlife food requires wetlands with high plant diversity and abundance, low concentrations of pesticides, and few fishes. Our work suggests many ways to manage and protect amphipod populations and their high biodiversity habitats.
48	2018	09a	Grants for Local Parks, Trails, and Natural Areas	MN DNR	Audrey Mularie	$ 2,000,000	Provide approximately 14 matching grants to local units of government for local parks, acquisition of locally significant natural areas and trails to connect people safety to desirable community locations and regional or state facilities. Park development includes nature-based recreation facilities and does not include playgrounds, sports courts or sport fields.

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49	2018	09b	Develop Mesabi Trail Segment From County Road 88 to Ely	St. Louis & Lake Counties Regional Railroad Authority	Bob Manzoline	$ 600,000	The Mesabi Trail is a project to build a paved trail from Grand Rapids to Ely. At the conclusion of this phase of the project, approximately 150 miles of the trail are complete. With this appropriation, permitting and engineering was completed, and construction began for this segment of the trail from County Road 88 to the City of Ely.
50	2018	09d	Mississippi Blufflands State Trail - Red Wing Barn Bluff to Colvill Park Segment	City of Red Wing	Jay Owens	$ 550,000	This project was intended to enhance Minnesotans experience of the natural beauty of the state through the development of 0.75 miles of trail. While much design and planning were completed for this trail, the actual trail could not be built due to land acquisition problems.
51	2018	10a	Sub-Project 03: Environmental Assessment of CWD Prions at the Beltrami County Deer Carcass Dump Site	U of MN - College of Veterinary Medicine	Peter Larsen	$ 108,232	We confirmed CWD-positive deer remains within the dumpsite and that the positive remains came from the neighboring cervid farm. We recommend: 5 years of CWD surveillance in the region, monitoring water runoff, routine CWD-testing of deceased cervid-farm fawns, monitoring wild mammal health in the area due to documented CWD risks.
52	2019	03c	Quantifying Exposure of Minnesota's Raptors to Mercury and PFAS	Hawk Ridge Bird Observatory	Matthew Etterson	$ 250,000	These results are a first look at polyfluoralkyl substances (PFAS) in Minnesota's Birds of Prey. Among vertebrates, birds appear to be most vulnerable to PFAS effects, which can result in reproductive failure. Birds of Prey are vulnerable to PFAS because of their position atop both aquatic and terrestrial food webs.
53	2019	03g	Mapping Habitat Use and Disease of Urban Carnivores	U of MN	Nicholas McCann	$ 500,000	This study provides information to residents and managers about coyotes and foxes. Our results reveal key insights, including about habitat requirements, the expansion of coyotes, and relationships between disease prevalence and free-roaming cats. They suggest outreach efforts to reduce free-roaming pets and management to increase natural vegetation in residential greenspaces.
54	2019	03i	Den Boxes for Fishers and other Nesting Wildlife	U of MN - Duluth NRRI	Michael Joyce	$ 190,000	Fishers used some den boxes, but it appears fishers find natural cavities to raise young. Den cavity availability alone is likely not causing the fisher population decline. Den boxes were used by many other wildlife species. Installing den boxes could be locally beneficial and increases public involvement with wildlife.

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55	2019	03j	Red-headed Woodpeckers as Indicators of Oak Savanna Health	U of MN	David Andersen	$ 171,000	Our project results provide important information on the factors associated with red-headed woodpecker habitat use, survival, and productivity in savanna ecosystems, which can aid ongoing habitat management and conservation efforts intended to conserve and restore this species in Minnesota.
56	2019	03n	County Geologic Atlases - Part A, Mapping Geology	U of MN - MN Geological Survey	Barbara Lusardi	$ 2,000,000	County Geologic Atlases were completed in two counties and work continued in 17 counties. Based on the time spent, this is equivalent to "completing" about five atlases. Atlas maps and data provide foundational information that supports water management activities to the benefit of drinking water and aquatic habitat.
57	2019	03o	County Geologic Atlases - Part B, Mapping Aquifer Hydrology	MN DNR	Paul Putzier	$ 2,400,000	The Groundwater Atlas provides foundational, science-based, information for use and management of Minnesota groundwaters. The atlas is valuable to government, industry, and for research. The grant supported work on nineteen atlases and publication of county groundwater atlases (County Atlas Part B) for Brown, Hennepin, Kanabec, Meeker, Morrison, Redwood, and Winona counties.
58	2019	03p	Unlocking the Science of Minnesota's Moose Decline	Minnesota Zoo	Nicole Mattson	$ 199,000	The Minnesota Zoo gathered moose researchers to share their key scientific research findings about Minnesota's moose decline. The research findings were used to develop interactive interpretive features for the Zoo's moose habitat, an educational website, and an engaging online game that highlights the survival challenges influencing Minnesota's moose population.
59	2019	03q1	Forest and Bioeconomy Research - Subproject 1: Optimizing management of Minnesota's forest landscapes	U of MN - Duluth NRRI	Rolf Weberg	$ 500,000	Projections of Minnesota forest composition and associated ecosystem services were developed under different climate and management scenarios from 2020 to 2100. This information was made freely available through a custom website and interactive mapping tool, providing resource managers with critical information for planning.
60	2019	03q2	Forest and Bioeconomy Research - Subproject 2: Expanding the Interactive Natural Resource Atlas for Minnesota	U of MN - Duluth NRRI	Rolf Weberg	$ 800,000	The Minnesota Natural Resource Atlas is an easy to use interactive mapping tool and spatial database that is freely available to all Minnesotans. It lowers or removes the barriers that prevent spatial data from informing the decisions that impact our state's natural resources.

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61	2019	03q3	Forest and Bioeconomy Research - Subproject 3 MFRC to support advancement of biochar for forest health	U of MN - Duluth NRRI	Rolf Weberg	$ 400,000	Biochar is a material that can be produced from residual biomass that can improve soil health and reforestation while storing carbon for the long term in soils. This project demonstrated production and deployment of insect-damaged balsam fir and black ash as biochar to improve seedling regrowth and retain nutrients in sandy forest soils.
62	2019	03q4	Forest and Bioeconomy Research - Subproject 4 Advance emerging Minnesota technologies to produce clean syngas from biomass	U of MN - Duluth NRRI	Rolf Weberg	$ 500,000	Synthesis gas (syngas) is a mixture of combustible chemicals that can be used to replace fossil fuels for industrial processes, hydrogen, and fuel production. This project demonstrated that forest residuals from insect-damaged trees can be pretreated to improve their conversion efficiency to make cleaner syngas.
63	2019	03r1	Minerals and Water Research - Subproject 1: Mobile Water Treatment Demonstration System for Sulfate Reduction	U of MN - Duluth NRRI	Rolf Weberg	$ 300,000	The project provides a cost-effective process for treating wastewater to meet the wild rice sulfate standard of 10 mg/L. The data gathered from the field pilot trial at two wastewater treatment plants will help in implementing a full-scale treatment system to reduce sulfate level for protecting water resources in Minnesota.
64	2019	03r2	Minerals and Water Research - Subproject 2: Western Mesabi Iron Resource Futures	U of MN - Duluth NRRI	Rolf Weberg	$ 275,000	This study initiated a long-term characterization program of the iron resources in Minnesota. Analysis of two sections of the iron formation produced a better understanding of the variability and potential for developing new iron-based products. With continued support, this program will provide a foundation for the future iron industry in Minnesota.
65	2019	03r3	Minerals and Water Research - Subproject 3: Develop emerging hydrometallurgy technologies	U of MN - Duluth NRRI	Rolf Weberg	$ 158,000	Based on outcomes of “voice of customer survey” and funding opportunities available through federal agencies, the project has identified emerging hydrometallurgical innovations with potential for processing Minnesota’s in-situ and waste mineral resources with a reduced water, energy, and environmental footprint. The project has also identified bench-top hydrometallurgical research equipment required to initiate development of next generation value-added products from under-utilized and under-valued in-situ mineral and waste resources in Minnesota, specifically low-grade ores, waste tailings, metallurgical residues, incinerator ash, power plant combustion residues, and waste electrical and electronic equipment.

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66	2019	03r4	Minerals and Water Research - Subproject 4: Accelerate high capacity/low cost energy storage options for Minnesota	U of MN - Duluth NRRI	Rolf Weberg	$ 150,000	The purpose of this project was to provide a technology survey and a geographical recommendation of potentially feasible, non-battery, long-duration energy storage technology concepts that can utilize Minnesota's various topographies, geologies, and infrastructure to facilitate the state's renewable energy and greenhouse gas reduction goals. Numerous technology concepts with related siting recommendations are reported for consideration by state leaders.
67	2019	04c	Wastewater Nutrient Reduction through Industrial Source Reduction Assistance	U of MN	Laura Babcock	$ 200,000	This project explored ways to keep Minnesota surface waters at high quality and make municipal wastewater treatment easier by reducing nutrient load sent to wastewater facilities by applying source reduction technical assistance at upstream industrial sites.
68	2019	04d	Quantifying Microplastics in Minnesota's Inland Lakes	U of MN - Duluth	Kathryn Schreiner	$ 200,000	This project has helped to determine the sources and fate of microplastics in inland lakes in Minnesota. This includes differences in loading between different watersheds and ecosystems, and differences in ingestion by different fish species.
69	2019	04i	Extracting Deicing Salt from Roadside Soils with Plants	U of MN	Bo Hu	$ 360,000	This project screened and evaluated several halophytic plants that can extract sodium chloride, the deicing salt, from soil, and accumulate it into the leafy biomass. The information can be used to develop phytoremediation methods to address the environmental pollution caused by the application of roadside deicing agents.
70	2019	04k	Accelerating Perennial Crop Production to Prevent Nitrate Leaching	Stearns County Soil and Water Conservation District	Dennis Fuchs	$ 440,000	Perennial cropping systems that include Kernza and alfalfa are effective in reducing nitrate leaching in sandy soils of Central Minnesota. Improved Kernza value chains for food, beverage and non-food have increased interest from farmers, food processors and consumers. The potential for Kernza production to provide future ecosystems services is great.
71	2019	04m	Setting Realistic Nitrate Reduction Goals in Southeast Minnesota	U of MN	John Nieber	$ 350,000	The time of travel of the nitrate ion in groundwater negatively impacts our ability to assess the effectiveness of best management practices to reduce the nitrate contamination of groundwater resources. This project developed field monitoring and modeling tools to quantity travel time and enhance the ability to assess BMP effectiveness.

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72	2019	04n	Mapping Unprofitable Cropland for Water and Wildlife	Science Museum of Minnesota - St. Croix Research Station	Jason Ulrich	$ 100,000	This project mapped an estimated 550,000 acres of unprofitable cropland in southern Minnesota. It was then estimated that converting 20% of these acres could significantly improve stream health and wildlife habitat.
73	2019	04o	Evaluating Locally Sourced Materials for Road Salt Reduction	U of MN - Duluth NRRI	Chan Lan Chun	$ 162,000	This project evaluated local ecological abrasive materials for use as alternative materials to lower road salt use in winter maintenance and consequent environmental impacts. The findings are useful for the development of the formulation and application practice for both water resource protection and safe winter roadway.
74	2019	04q	Restoring Impaired Lakes through Citizen-Aided Carp Management	Carver County Water Management Organization	Andrew Dickhart	$ 106,000	This project demonstrated new innovative methods of carp management that includes local volunteer residents. The use of baited box nets and an electric guidance system produced an integrated and multi-faceted approach to long term carp management, which we know is important given the longevity of the species.
75	2019	05a	Expanding Camp Sunrise Environmental Program	YouthCARE MN	Lori Arnold	$ 237,000	Project did not occur; funds returned.
76	2019	05c	Mississippi National River and Recreation Area Forest Restoration	Mississippi Park Connection	Mary Hammes	$ 199,000	Mississippi Park Connection and its partners planted 15,069 native trees and shrubs in the Mississippi National River and Recreation Area to address tree canopy loss due to Emerald Ash Borer. The project also established a Mississippi River Crew with the Conservation Corps of Minnesota and Iowa and engaged volunteers.
77	2019	06b	Oak Wilt Suppression at its Northern Edge	Morrison Soil and Water Conservation District	Shannon Wettstein	$ 100,000	Morrison SWCD partnered with DNR Forest Health Specialists and local DNR Foresters to suppress oak wilt at 18 sites within Morrison County through mechanical means. These sites are the northern-most occurrences of oak wilt in the state through on the edge of healthy state forest habitats.
78	2019	07a	Development of Clean Energy Storage Systems for Farms	U of MN - WCROC	William Northrop	$ 650,000	This project was the first to demonstrate that anhydrous ammonia mixed with a small quantity of hydrogen can fuel on-farm grain-drying equipment. Ammonia contains no carbon molecules. Therefore, its combustion emits no carbon emissions when produced renewably from wind or solar power, reducing the carbon intensity of agriculture in Minnesota.

Environment and Natural Resources Trust Fund (ENRTF)
Final Reports for 2022

Line	Year	Subd.	Title with link to Final Report	Organization	Project Manager	Funding Amount	Soundbite
79	2019	07b	White Earth Nation Community Solar for Economic Resilience	Rural Renewable Energy Alliance (RREAL)	Nicole Saccoman	$ 500,000	200 kWs of solar community gardens were installed on the White Earth tribal reservation. This project will greatly reduce greenhouse gas emissions for years to come, in addition to providing energy resilience to the White Earth community. Furthermore, this project has increased economic development through environmental education and solar workforce training.
80	2019	08c	Sauk River Dam Removal and Rock Rapids Replacement	City of Melrose	Colleen Winter	$ 2,768,000	Project did not occur; funds returned.
81	2019	09g	Mesabi Trail Extensions	St. Louis & Lake Counties Regional Railroad Authority	Bob Manzoline	$ 3,000,000	This project was an important part on nearing the completion of a planned 162 mile long paved bicycle trail stretching from Grand Rapids to Ely, MN. The ENRTF funding along with other funds allowed for the completion of four (4) segments of the Mesabi Trail which are: Darwin Meyers Wildlife Management Area to County Road 21 (approximately 2 miles), Embarrass to Kugler Township (approximately 9 miles), County Road 128 to Eagles Nest Town Hall (approximately 2 miles), and Wolf Creek to the Highway 169 underpass (approximately 3 miles).
82	2019	09l	Vergas Long Lake Trail	City of Vergas	Julie Lammers	$ 290,000	This project restored the ecological functions of the Long Lake shoreline and protected the banks against erosion. Bank restoration and stabilization efforts within the project restored the physical, biological, and chemical functions of the shoreline improving water quality through reduction of chronic sedimentation.
83	2019	09m	Glacial Edge Trail and Downtown Pedestrian Bridge	City of Fergus Falls	Andrew Bremseth	$ 600,000	The City of Fergus Falls used ENRTF funds to engineer and construct portions of a larger downtown riverfront enhancement project that included a 600 ft shared use trail, pavilion, farmer's market, restroom, and trailhead kiosk. The project was unveiled on June 30, 2022, to celebrate the City's 150th anniversary.
84	2019	09o	Restoring Five Sections of the Superior Hiking Trail	Superior Hiking Trail Association	Lisa Luokkala	$ 191,000	The Superior Hiking Trail, which traverses the ridgeline of Minnesota's north shore, was repaired in some its most damaged sections. A well maintained SHT keeps people on the trail and water off, the adjacent land and water are protected, and a human connection to nature is preserved.
85	2019	10c	LCC Administration	Legislative Coordinating Commission	Sally Olson	$ 3,000	N/A
86	2019	11a	Water Infrastructure Loans	Public Facilities Authority	Jeff Freeman	$ -	N/A