

**North Dakota Industrial Commission
Outdoor Heritage Fund Grant Application**

Name of Organization: North Dakota State University

Federal Tax ID#: 45-6002439

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List names of co-applicants if this is a joint proposal:

Major Directive:

Directive A. Provide access to private and public lands for sportsmen, including projects that create fish and wildlife habitat and provide access for sportsmen;

Directive B. Improve, maintain, and restore water quality, soil conditions, plant diversity, animal systems and to support other practices of stewardship to enhance farming and ranching;

Directive C. Develop, enhance, conserve, and restore wildlife and fish habitat on private and public lands; and

Directive D. Conserve natural areas for recreation through the establishment and development of parks and other recreation areas.

Additional Directive:

Directive A. Provide access to private and public lands for sportsmen, including projects that create fish and wildlife habitat and provide access for sportsmen;

Directive B. Improve, maintain, and restore water quality, soil conditions, plant diversity, animal systems and to support other practices of stewardship to enhance farming and ranching;

Directive C. Develop, enhance, conserve, and restore wildlife and fish habitat on private and public lands; and

Directive D. Conserve natural areas for recreation through the establishment and development of parks and other recreation areas.

Type of organization:

State Agency

Political Subdivision

Tribal Entity

Tax-exempt, nonprofit corporation, as described in United States Internal Revenue Code (26 U.S.C. § 501 (c))

Project Name

Habitat Enhancing Biofuel Crops

Abstract/Executive Summary

The Habitat Enhancing Biofuel Crops project will develop crops to be used in Second Generation Biofuel production while it improves, maintains, and restores water quality, soil conditions, plant diversity, animal systems and supports other practices of stewardship to enhance farming and ranching. The project will breed and select crop lines and cultivars of oilseed crops, energy beets, and perennial grasses useful to produce biofuel. The Federal Aviation Administration and the aviation industry has made it clear that it is only looking at second-generation biofuels and is determined not to repeat the mistakes made with first-generation sources, expecting any supply to be fully sustainable.(www.enviro.aero) First-generation biofuels use crops otherwise used for food, use valuable farming land, can have a negative effect on food prices,

accelerate deforestation, potentially have a negative impact on biodiversity, compete for scarce water resources, and can create larger carbon footprint to produce. Second generation biofuels use non-food crop sources, can be grown on less productive farm land and in arid conditions, can be grown without rainforest destruction, have potential for new industries, have a diverse range of crops being investigated, and have a smaller carbon lifecycle footprint. These same crops will add plant diversity to our North Dakota landscape and meet nearly all the directives of this grant.

Thirty-five years ago when I came to the NDSU-North Central Research Extension Center (NCREC), much of the landscape was one-half black summer fallow and one-half crop, usually wheat or some other small grain or flax. The introduction of hybrid sunflower expanded the farmed land to two-thirds crop and one-third fallow. The introduction of canola (*Brassica spp.*) changed the cropping patterns to three-fourths crop and one-fourth fallow. The introduction of dry peas, lentils, and chickpeas added a nitrogen fixing legume to the crop sequence and led to continuous or nearly continuous cropping. Dry beans, corn, and soybeans, as well as other specialty crops and forages, have added to farmers' and ranchers' opportunity to keep the land covered in vegetation. All of this provides wildlife habitat and protects the land from eroding into fisheries. Continuous cropping to a wide variety of crops and forages; early and late season, deep and shallow rooted, grassy and broadleaf crops, nitrogen-fixing and high nitrogen using, is the best practice to re-claim and maintain soil health. This addresses Directive B. to "improve, maintain, and restore water quality, soil conditions, plant diversity, animal systems and to support other practices of stewardship to enhance farming and ranching."

Some of us are old enough to remember vast acreages of native prairie, followed by the soil-bank days, and more recently the Conservation Reserve Program (CRP). My travels across North Dakota reveal the loss of CRP acreages, as these acres give way to corn, soybeans and other high return crops. All of this results in less wildlife habitat and potentially more erosion or damaged fisheries.

One of the crops under investigation, *Brassica carinata* also called Ethiopian mustard has been studied at the NCREC for the past two years. It is more drought tolerant than canola and produces a long chain fatty acid very suitable for aviation fuel. Another crop investigated will be pennycress, a relative of field pennycress which is a winter annual with excellent winter hardiness. Pennycress and winter canola can also provide fall and winter cover for the soil and support nesting wildlife much like winter wheat does for the Ducks Unlimited project and to prevent soil erosion. Perennial grasses grown with and without legumes, like sweetclover and alfalfa, can provide biofuel or hay or pasture for ranchers and wildlife habitat very similar to what CRP acreage does now.

As an example of the use of aviation biofuel use, KLM Royal Dutch Airlines started weekly flights from John F. Kennedy Airport to Schipol (Netherlands) using sustainable biofuel in March 2013. Flight KL642 is operated by a Boeing 777-200 every Thursday. The larger aim is to stimulate a more sustainable airline industry by reducing CO2

emissions, increasing fuel efficiency, and investing in innovations like sustainable biofuel.

The breeding and development of agronomic production practices for these energy crops will put more plant life and biodiversity on the North Dakota landscape. This can allow for more access to private lands for sportsmen as it creates wildlife habitat in addition to a cash crop for farmers or feed for ranchers. These crops will improve, maintain, and restore water quality, soil conditions, plant diversity, animal systems and support stewardship to enhance farming and ranching. Growing these crops will help develop, enhance conserve, and restore wildlife habitat and serve as riparian area to restore fish habitat on private and adjacent public lands. Adding to the biomass production and biodiversity on acres raising these crops will conserve these and other natural areas for recreation through their establishment across our landscape.

Amount of Grant Request \$147,954

Total Project Costs \$240,534

Amount of Matching Funds \$92,580

\$54,112 Cash, \$38,468 Indirect

Source(s) of Matching Funds

ND Agricultural Experiment Station and North Dakota State University. The NDAES provides the salary and fringe benefits and the university provides the indirect costs.

Certifications

X I certify that this application has been made with the support of the governing body and chief executive of my organization.

X I certify that if awarded grant funding none of the funding will be used for any of the exemptions noted on Page 1 of this application.

Narrative

Organization

North Dakota State University first opened as a public land grant institution in Fargo, North Dakota, in 1890, shortly after North Dakota officially became a state in November 1889. Initially known as the North Dakota Agricultural College, the college's name was changed to North Dakota State University in 1960. The North Dakota Agricultural Experiment Station and NDSU Extension Service are integral parts of the University. NDSU accepted its first graduate students in 1895.

NDSU has enjoyed steady growth, with enrollment now exceeding 14,500 students and over 700 faculty members. NDSU offers over 100 undergraduate and approximately

100 graduate programs in a wide variety of fields, with degrees awarded at the doctoral, master's, professional, and baccalaureate levels. In addition to their academic studies, students have opportunities to participate in approximately 300 student organizations, leadership development, civic engagement activities, fine arts, athletics, and study abroad.

NDSU is part of the North Dakota University System (NDUS) which includes 11 campuses across the state. The State Board of Higher Education (SBHE) is the policy-setting and governing body for the NDUS. The SBHE is made up of seven citizen members appointed to four-year terms by the governor, one student appointed by the governor to serve a one-year term, a non-voting faculty advisor and a non-voting staff advisor. NDSU is headed by a President, with a Provost who provides administrative leadership for all academic activities, including eight academic colleges and the graduate school.

NDSU's mission statement: "With energy and momentum, North Dakota State University addresses the needs and aspirations of people in a changing world by building on our land-grant foundation." With its land-grant mission to provide quality education, leading-edge research and excellent service, NDSU is acknowledged as a national leader among its peers.

Purpose of Grant

The purpose is to breed bio-energy crops and to improve the agronomic production factors necessary to produce biofuel for aviation and other uses. If successful, this project will increase the bio-diversity of plants and therefore lands of North Dakota which will increase wildlife habitat while enhancing farming and ranching.

We will collaborate with breeders and geneticists of new crops to increase the biodiversity of our North Dakota landscape. The crops we will work with are: *Brassica carinata* (Ethiopian mustard), pennycress, juncea, camelina, winter canola, energy beets, and perennial grasses. This is a labor intensive program necessitating pollen control to segregate plants in many nurseries.

Land devoted to these experiments is public land and open to the public with permission. The much larger effect will be when these crops are grown in rotation with all the other diverse crops now grown by our farmers and ranchers. These crops will add diversity of cover, improvement and maintenance of land and water quality, and improvement in soil conditions. Our land attracts deer, geese, ducks, pheasants, partridge and other wildlife. These new and even more diverse crops will enhance that wildlife attraction. This research will support stewardship and enhance farming and ranching. Switchgrass and tall and intermediate wheatgrasses, planted with and without clover and alfalfa as mixtures, provide excellent wildlife habitat and can provide ranchers with forage for grazing and haying. While established on NCREC land, and much more importantly when incorporated into farming and ranching practices, this work will develop, enhance, conserve, and restore wildlife and fish habitat as compared to fallow or other farming practices such as monocultures or two-crop rotations. This

research will add to the conservation of natural areas for recreation. This grant will be supplemented by private breeding programs, sugarbeet companies (energy beets), and other companies and agencies. The Air Force, Navy, and commercial airlines are interested in vegetable-based fuels which are non-food for their immediate future (Second Generation Biofuels). This work will be sustained by regular research project funding as strong interest continues, by private breeding programs, and other companies entering the end-use product chain in the future. This funding will be for both new and innovative plant breeding and crop establishment work as well as replacing and supplementing work on other bio-fuel crops we have been working on for many years. Borage, safflower, and many mustard oils have been researched at the NCREC over the years. Biomass has been studied for a very long time. Energy beets are a relatively new development. Funding is requested for two years beginning in 2014. Continuation of the program is planned long into the future.

Management of Project

The project will be managed by Jay Fisher, Director, NCREC. Jay has more than 35 years of experience as an agronomist and 20 years of experience as Director of a crop research facility. A life-long North Dakotan, farm and ranch kid, and avid hunter and fisherman, he appreciates good wildlife habitat and his home ranch, now managed by a fifth generation Fisher, still has more than a section of native prairie and a well-managed diversity of crops, forages, wetlands, and rangeland.

Eric Eriksmoen, research agronomist at NCREC, will lead the day-to-day project activities. Eric has 24 years of experience as a research agronomist in the North Dakota State University system, both at Hettinger REC and NCREC. He is well versed in dryland farming, plant breeding and development, and research project oversight.

Evaluation

Meticulous field plans and growing season notes will be maintained. Records of parental lines and progeny will be kept. Results will be new and improved breeding lines, improved agronomic production practices, and crop establishment methods. Success will be a new and adapted cultivar of the species. Further success will be the integrated planting of these crops across the North Dakota landscape. Periodic reports, final evaluation, and expenditure reports will be completed.

Financial Information

Project Budget

Project Expense	OHF Request	Applicant's Match Share (Cash)	Applicant's Match Share (In-Kind)	Applicant's Match Share (Indirect)	Other Project Sponsor's Share
Salaries	\$46,800	\$41,624			
Fringe Benefits	\$4,680	\$12,488			
Travel	\$18,440				
Supplies	\$60,034				
Fees	\$12,000				
Publications	\$6,000				
Unrecovered Indirect Costs				\$38,468	
Total Project Costs	\$147,954	\$54,112		\$38,468	0

Budget Narrative

Salaries-\$46,800

3 students and/or part-time workers @ \$15 per hour for 40 hours per week for 13 weeks per year for 2 years

Fringe Benefits-\$4,680

Calculated at the university accepted rate of 10%. Includes workers compensation, social security, and unemployment.

Travel-\$18,440

Trips to fields. 3,000 miles per year @ \$.74 per mile for 2 years (\$4,440)

Travel to bio conferences to present data, collaborate with other investigators, establish coalitions, and learn new technologies (\$14,000)

Supplies-\$60,034

96,000 ft. 1 ¼" round steel rods (\$17,875 per year for 2 years)

3,000 23" X 78" self-pollination bags (\$8,292 per year for 2 years)

3,000 12" X 12" self-pollination bags (\$1,850 per year for 2 years)

Fuel (\$1,000 per year for 2 years)

Pesticides (\$1,000 per year for 2 years)

Fees-12,000

Laboratory analysis of samples (wet chemistry)

Publications-\$6,000

X I certify that a project budget will be sent to the Commission

Matching Funds-\$92,580

PI Fisher will serve as the overall project coordinator and the lead on the breeding program. Eriksmoen will serve as field operations coordinator and the lead on plot planting, maintenance, and harvest. Both Fisher and Eriksmoen will contribute 10% FTE (salary + 30% fringe benefits). Year 1 salary and benefits are \$26,655 and year 2 salary and benefits are \$27,457.

North Dakota State University will be providing indirect costs to support this project. NDSU's federally approved indirect cost rate is 26% of modified total direct costs, $\$147,954 * 26\% = \$38,468$.

Sustainability

Private breeding programs will co-fund this research and breeding project. Upon successful use of these crops for end-use product, such as jet fuel, the demand will attract continued funding for the program. Other uses, not yet realized for these oils, could result in attractive demand for their production. The CLEEN II (Continuous Lower Energy Emissions & Noise) division of the Federal Aviation Administration continues to support this major initiative (email cleen@faa.gov)-Office of Environment and Energy.

Partial Funding

If less funding is available we will narrow the focus of the grant by reducing the number of crops investigated, reducing the number of lines (cultivars) evaluated, and/or seeking additional funding from alternate sources (FAA, USDA, private breeding programs, etc.).

Scoring of Grants

All applications will be scored by the Outdoor Heritage Fund Advisory Board after your ten-minute oral presentation. The ranking sheet(s) that will be used by the Board is available on the website at <http://www.nd.gov/ndic/outdoor-infopage.htm>.

Awarding of Grants

All decisions on requests will be reported to applicants no later than 30 days after Industrial Commission consideration. Applicants whose proposals have been approved will receive a contract outlining the terms and conditions of the grant. Please note the appropriate sample contract for your organization on the website at <http://www.nd.gov/ndic/outdoor-infopage.htm> that set forth the general provisions that will be included in any contract issued by the North Dakota Industrial Commission. Please indicate if you can meet all the provisions of the sample contract. If there are provisions in that contract that your organization is unable to meet, please indicate below what those provisions would be.

Should this project be selected for funding and a contract is issued to NDSU, we request the sample language in article 11 and 20 be deleted and the following

replacement language be inserted in articles 11 and 20 of the sample contract for a state entity.

11. Ownership of Work Product, Equipment and Materials

Title to all inventions and discoveries made solely by Contractor inventors resulting from the Agreement shall reside in Contractor; title to all inventions and discoveries made solely by Commission inventors resulting from the Agreement shall reside in Commission; title to all inventions and discoveries made jointly by Contractor and Commission inventors resulting from the Agreement shall reside jointly in Contractor and Commission. Inventorship shall be determined in accordance with U.S. Patent Law.

20. Compliance with Public Records Law

Contractor understands that, except for disclosures prohibited in this Agreement, the Commission must disclose to the public upon request any records it receives from the Contractor. Contractor further understands that any records that are obtained or generated by the Contractor under this Agreement, except for records that are confidential under this Agreement, may, under certain circumstances, be open to the public upon request under the North Dakota open records law. Contractor agrees to contact the Commission immediately upon receiving a request for information under the open records law and to comply with the Commission's instructions on how to respond to the request.

Responsibility of Recipient

The recipient of any grant from the Industrial Commission must use the funds awarded for the specific purpose described in the grant application and in accordance with the contract. The recipient cannot use any of the funds for the purposes stated under Exemptions on the first page of this application.