Leadership Council Funding Proposal Application

Project Title: *CASE Summer Institute: Natural Resources and Ecology (Fast-Track Institute)*

Timeline: *June 21-26, 2020*

Amount of Funds Requested: *$34,250*

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Abstract of Proposal

Background. Since 1917, agricultural education has been a transformational part of the high school curriculum for millions of young people. Agricultural education prepares students for successful careers and a lifetime of informed choices in the global agriculture, food and natural resource systems.

Based on an integrated model of delivery, an agricultural student experiences classroom instruction, leadership experience through FFA, and experiential learning via a student's Supervised Agricultural Experience (SAE). Today students receive this premier experience in 189 secondary schools across Nebraska. This is a growing career field that prepares students for Nebraska's largest industry. Over 60 Nebraska schools have added an agricultural education program since 2010.

Rationale. Like the agricultural industry, agricultural education is changing to meet the needs of a new generation of today's students who will be challenged to feed a world of 9 billion people as they reach the peak of their career in 2050. The industry has changed to rely heavily on emerging biosciences to grow more food on less land, while keeping the food supply nutritious, safe and affordable. In particular, agriculture is Nebraska's number one industry and an economic driver for the state. One of every three Nebraska jobs is agriculturally based. Nebraska's agricultural industry is in need of future employees, entrepreneurs and innovators to meet the challenges of tomorrow and to sustain this vital segment of the state's economy. These demands have created vibrant and exciting potential career opportunities for Nebraska's secondary students.

Curriculum. A nationally supported, intensive, and STEM-based curriculum is available for Agricultural Education programs. The Curriculum for Agricultural Science Education (CASE) was developed in 2007 by the National Council of Agricultural Education with the goal of implementing a national curriculum for secondary agricultural education that provides a high level of educational experiences to enhance the rigor and relevance of agriculture, food, and natural resources (AFNR) subject matter. In addition to elevating the rigor of AFNR knowledge and skills, CASE provides purposeful enhancement of academic and STEM learning.

CASE develops curriculum utilizing science inquiry for lesson foundation and concepts that are taught using activity-, project-, and problem-based instructional strategies. In addition to the curriculum aspect of CASE, the project ensures quality teaching by providing extensive professional development for teachers that leads to certification. CASE is modeled after Project Lead The Way (PLTW), a national pre-engineering curriculum that has been adopted by many Nebraska schools. The Nebraska Department of Education has recognized the value of CASE courses by adopting course codes specifically for CASE coursework and include them in their Programs of Study.

Plan. Waverly Public Schools, in cooperation with the University of Nebraska—Lincoln will host the *Natural Resources and Ecology* CASE course. Waverly and UNL have co-hosted previous CASE institutes, including Introduction to AFNR, Animal Science, Plant Science and the Natural Resources and Ecology course. Each time the institute was hosted at Waverly High School the institute has filled to capacity or has over-filled due to high demand. Teachers have commented that they appreciate CASE Institutes being held at a high school, as it more accurately mimics the space and resources available in their local program compared to a college campus.

The institute will be a five-day intensive training resulting in the practice of all included laboratories for an entire school year. Twenty teachers will participate in the institute that is taught by lead teachers from CASE. Upon completion of the institute, teachers will become certified to teach the CASE *Natural Resources and Ecology* course, which is an intermediate course in NDE's Environmental and Natural Resources Program of Study.

Because teachers from other states may be invited to the training (per CASE's requirement), PFI grant dollars would only be spent on fixed costs to hold an institute and scholarships to Nebraska in-service teachers attending the institute. Teachers who cannot attend the Nebraska Institute would also have access to attend another institute offered in a partner state.

Vision and Purpose:

1. *Describe the connection(s) to the PFI Areas of Focus*
   Holding a *Natural Resources and Ecology* CASE Institute would meet four of the five PFI Areas of Focus.
   - **Statewide Partnerships and Initiatives**
     - The CASE Institute would be offered to teachers throughout Nebraska and provide a tested and successful national curriculum in this career field. UNL also capitalizes on this institute by designing in-service teacher professional development that compliments the principals of the institute in addition to integrating CASE concepts into the teacher education program.
   - **Technical Skill Assessment**
     - Secondary students participating in the *Natural Resources and Ecology* course will experience engaging "hands-on" activities, projects, and problems. Student experiences will involve the study and science of agriculture, biomes/ecosystems, soil/water/air, energy, human impact, resource management, sustainability and environmental policies. While engaging in the content in *Natural Resources and Ecology*, students will learn to solve problems, conduct research, analyze data, work in teams, and take responsibility for their work, actions, and learning. *For example*, students will study both the plants and habitat for an area near their school and develop a relevé (a plot that encloses the minimal area under a species-area curve) as a practical learning exercise. (See appendix for this sample lesson plan.)
   - **Professional Development**
     - The CASE Institute is a professional development workshop to provide teachers training for the instruction related to a specific CASE course. Once a teacher has successfully completed 40+ hours of intense professional development at a CASE Institute, the teacher is certified to teach that specific CASE course.
     - CASE Institute sessions provide teachers important background related to the pedagogy used in CASE curricula and practice teaching various lessons to prepare them for classroom instruction. Teachers are required to attend the entire five-day "fast track" workshop and CASE Lead Teachers determine if each participating teacher is adequately prepared to provide instruction using CASE curricula.
   - **Curriculum in Emerging Areas**
     - The CASE *Natural Resources and Ecology* course is considered a cutting-edge course studying environmental, natural resources and sustainability-related topics. This also addresses a curriculum area that is under-served within agricultural education while also helping to attract non-traditional student into the agriculture, food and natural resources career field. Furthermore, the curriculum and association professional development (the CASE Institute) combines both content and innovative pedagogy (inquiry-based learning, project-based learning, etc.), helping participating teachers and pre-service teachers to further their personal content knowledge *and* teaching skills/techniques.

2. *Explain why this activity or product is innovative*
   CASE courses consist of a full year of lessons that utilize activity-, project-, and problem-based learning set in an inquiry-based approach. CASE has the goal to increase the rigor and relevance of agriculture subject matter and enhance core academic areas including science, mathematics, and English. A CASE curriculum provides the teacher everything they need to facilitate classroom instruction except equipment and supplies. CASE is student-directed and inquiry-based.

There is excitement across Nebraska agriculture teachers who have heard about the successes or previous attendees. ***Of all of the previous CASE institutes held in Nebraska, the Natural Resources and Ecology course was the best reviewed course by previous participants.*** By hosting this course for a second time (after four years), Nebraska will provide an important entry-point for a new group of teachers in a content area that many have less personal experience. With support of PFI, UNL and other potential sponsors, we plan to offer this institute to five pre-service teachers who will be student teaching with CASE-certified teachers at minimal cost (NOTE: PFI funds will not be used to support UNL pre-service teachers; UNL and outside sponsors will fund pre-service scholarships). Teachers have overwhelmingly expressed their appreciation for PFI's and the other private industry supporters who enable them to participate in CASE institutes due to this scholarship program. *When surveyed in 2015, 93% of participating Nebraska teachers over the previous three years have stated they would not be able to attend CASE without this level of support.*

3. *Describe the overall outcomes*

   The CASE Institute will allow up to 15 in-service teachers and five pre-service teachers to be certified to teach the *Natural Resources and Ecology* course. Nebraska agricultural education teachers teach an average of nearly 100 students each year across all of their courses. If this is one course in an eight-period day, in one year of teaching, this curriculum has the potential to reach approximately 300 students, allowing them to experience intensive project-based, STEM integrated curriculum in an agricultural context. Based on the successes from other states and the last seven years in Nebraska, more of these students will likely remain in a program of study and choose to enter a related career path.

Needs Statement:

- *Provide information which supports the purpose of the proposal*
  The Agriculture, Food and Natural Resources Career Field is a strength in Nebraska as indicated by the following data:

  According to former Governor Heineman in the Chadron Record on March 18, 2010, *"Agriculture is Nebraska's largest industry with one in every three jobs related to agriculture."* Governor Ricketts echoes the importance of agriculture to Nebraska, "*A formative part of our past, agriculture is crucial to our state's future. There's no better way to move our state forward than by growing agricultural opportunities."*

  Based on data from Nebraska's H3: High Wage, High Demand, High Skill website (h3.ne.gov), the Agriculture, Food and Natural Resources Cluster consistently ranks in the top three clusters for Nebraska H3 sectors statewide.

  As measured by the Nebraska Department of Agriculture and the USDA, cash receipts from farm products contributed over $21 billion to Nebraska's economy in 2017, which is 5.7% of the US total. Additionally, every dollar in agricultural exports generates $1.28 in other economic activity with the state. In total, over 93% of Nebraska's total land area is in agricultural use (Nebraska Agriculture Fact Card, Nebraska Department of Agriculture, February 2019).

  According to the Battelle Study in 2010, the Biosciences industry represents one of the top five current strengths in Nebraska, with agricultural and food processing and agricultural machinery classified as retention industries for the state. It was also found that renewable energy is an area that Nebraska should continue to lead. (Battelle Study, Nebraska DOL & DED, 2010)

  World population passed 7 billion people in 2012. By 2050, at the height of our current secondary students' careers, world population is expected to surpass 9 billion people. (US Census Bureau, 2011)

- *Communicate the need related to the data*
  Given the above facts and predictions, it will be a global challenge to feed and clothe the growing human population and Nebraska is positioned to become a central player in finding the solutions to that dilemma. This challenge will require the best minds of today. It is expected that current secondary students will solve the world's biggest future challenges by developing processes to feed and clothe the growing population by developing the necessary science, technology and policies. The *Natural Resources and Ecology* CASE course provides a foundation in technical content and academic and STEM principals that will enable our students to meet that challenge while preparing students to do so in a sustainable, holistic way that into mind earth's natural resources.

- *Identify the stakeholders who will be impacted by the activity and how they will be served*
  Stakeholders for the *Natural Resources and Ecology* CASE Institute include up to 15 teachers and five pre-service teachers who will participate in the five-day professional development. They will be exposed to both technical content and pedagogy of the curriculum, experience a year's worth of laboratories that they will use in their classrooms, and become certified to teach the course. Additionally, it is estimated that an average of 300 students will participate in their combined courses,

gaining technical knowledge and skills that will help them become college and career ready for careers in AFNR. The final stakeholder groups would be post-secondary institutions and the industry, both of which will benefit from better-trained and motivated students who will become tomorrow's college students, entrepreneurs and employees.

Goals and Objectives: *The goals should be directly related to the PFI Areas of Focus and Purpose Statement; the objectives should be related to the activities and outcomes as a result of the activity or product*

- *Outline the objective(s) to include measurements, expectations and timeline*
- *Communicate the activities related to the objectives*

Goal: To train and certify 15 Nebraska secondary and five pre-service teachers to teach the *CASE Natural Resources and Ecology* course through their completion of a five-day CASE "Fast Track" Institute in June 2020.

This goal meets four PFI Areas of Focus: Statewide Partnerships and Initiatives through the implementation of the Nebraska Department of Education AFNR Programs of Study via a national curriculum, Technical Skill Assessments through a rigorous curriculum that teaches and measures students' skills within AFNR pathways, Professional Development by offering a five-day intensive training for secondary teachers, ending with certification to teach the curriculum, and Curriculum in Emerging Areas by offering a comprehensive, cutting-edge curriculm in an underserved content area that infuses innovative pedagogical methodologies through teacher professional development.

a. **Activity 1:** Utilizing PFI *and* private funds (found by the National CASE group national sponsors, Nebraska FFA Foundation or other sources) to subsidize the $2,500 fee for teachers to attend through the distribution of scholarships for Nebraska participants and/or to help pay for necessary equipment/supplies to teach the CASE curriculum locally.
b. **Activity 2:** Waverly Public Schools will assess an administrative fee of $500 as a fixed cost.

Impact on Career and Technical Education: *Communicate how CTE will be impacted as a result of the activity or product*

1. *Identify the number of students, teachers, and/or partners involved*

   The CASE Institute will allow up to 15 teachers to be certified to teach the *Natural Resources and Ecology* course in addition to five pre-service teachers. Nebraska agricultural education teachers teach an average of nearly 100 students each year across all of their courses. If this is one course in an eight-period day, in one year of teaching, this curriculum has the potential to reach approximately 300 students, allowing them to experience intensive project-based, STEM integrated curriculum in an agricultural context.

   The *Natural Resources and Ecology* course also serves as an intermediate level course for the Environmental and Natural Resources Program of Study.

2. *Communicate the impact of the activity on student learning and/or professional growth*

   A previous PFI project in 2010 facilitated the development of AFNR Programs of Study and Course Standards. In July 2013, four specific CASE courses were added to Nebraska's Course Codes and Clearing Endorsements document were recognized as an official course and Program of Study by the Nebraska Department of Education (this work was also facilitated by PFI). With updated standards that were adopted by the Nebraska Board of Education beginning in 2018, additional CASE courses were added as recognized courses by the Nebraska Department of Education. Additionally, the CASE *Natural Resources and Ecology* course has been built to incorporate standards in Science, Math and Language Arts in addition to STEM principals.

   CASE develops curriculum utilizing science inquiry for lesson foundation and concepts that are taught using activity-, project-, and problem-based instructional strategies. In addition to the curriculum aspect of CASE, the project ensures quality teaching by providing extensive professional development for teachers that leads to certification. Teachers will likely utilize these inquiry-based strategies in other courses, therefore growing their pedagogical expertise in addition to technical content.

3. *Describe how the project/activity is relevant to the Nebraska Career Field Model, Economic and/or Workforce Development*

   The *Natural Resources and Ecology* course serves as an intermediate-level course for the Environmental and Natural Resources pathway in Nebraska's Program of Study model, which was approved by the Nebraska Board of Education in 2018. In essence, this course is an foundational course for students studying natural resources, wildlife and environmental management.

   As outlined in the Needs Statement, Nebraska's economy is driven by agriculture's success. According to the Battelle Study, the H3 site and other sources, the state is poised to lead many industries based on its geographic location, the available natural resources, its infrastructure, and human expertise that exist here.

Statewide Impact: *Communicate how the activity will impact or be made available to the entire state***.**

1. *Outline how the activity will reach all secondary and postsecondary consortia members*

   All Nebraska teachers who teach courses in Agriculture, Food and Natural Resources are invited to participate in the Institute. It will be advertised via the listserv, the University of Nebraska—Lincoln website, the national CASE website, and through the Nebraska Agricultural Educators Association, which represents both secondary and post-secondary (2- and 4-year) educators. Community College and NCTA faculty are also welcome to visit the institute to see how the secondary curriculum may connect to their postsecondary offerings.

2. *Identify which of the Nebraska Career Clusters or Fields are addressed/identified.*

   The Agriculture, Food and Natural Resources Career Field and Cluster are the primary targets for this project.

3. *Describe the collaboration with external stakeholders/partners such as: Business, community, state or private colleges/universities, Nebraska Department of Education, professional career education association groups, etc.*

   The following are partners in the project:
   - Waverly High School – Facilitation & Site Host
   - UNL Department of Agricultural Leadership, Education and Communication - Facilitation
   - Nebraska FFA Foundation – Financial Partner in 2012 – 2019 (2020 funding TBD)
   - CHS Foundation – Financial Partner in 2012 - 2014
   - Nebraska Soybean Board – Financial Partner in 2012 - 2019
   - Nebraska Pork Producers Association – Financial Partner in 2014
   - UNL College of Agricultural Sciences and Natural Resources – Facilitation & Faculty Support
   - CASE: Curriculum for Agricultural Science Education, NAAE – National organization, delivery of the content/professional development

4. *Address the proposed delivery method: statewide, regional meetings, face-to-face, distance education, online, conference, etc.*

   The CASE Institute will take place June 21-26, 2020 At Waverly High School from 8 AM – 5 PM on weekdays. The meeting is face-to-face with ad-hoc support via Communities of Practice, an online discussion board hosted by the National Association of Agricultural Educators.

Evaluation: *Describe the project evaluation plan as it relates to the goals and objectives*

1. *Provide evidence of the impact based on the project goals and objectives*

Project organizers will measure the effectiveness of the *Natural Resources and Ecology* CASE Institute by the stated goal and objectives:

Goal: To train and certify 15 secondary teachers and five pre-service teachers to teach the CASE *Natural Resources and Ecology* course through their completion of a five-day CASE "fast track" Institute in June 2020.

Objectives include:

a. **Activity 1: Teacher Scholarships**
    a. Utilizing PFI funding to subsidize the $2,500 fee for teachers to attend through the distribution of scholarships for Nebraska participants. Each in-service teacher will received a $2,250 scholarship, leaving $250 to be covered as an investment by the local school district. (NOTE: PFI funds will not be used to support pre-service teachers. Their expenses will be covered by UNL or another outside source.)
b. **Activity 2: Fixed Cost**
    a. Waverly Public Schools will assess an administrative fee of $500 as a fixed cost.

Project organizers will maintain contact with participating teachers to provide support to participating teachers during the school year.

Dissemination of Knowledge:

1. *Draft a brief executive summary for publication in the PFI newsletter and/or state/national association publications.*

Nebraska will host an intensive professional development training for high school agricultural education teachers that will prepare them to teach about agriculture, food and natural resources in a new way. The Nebraska *Natural Resources and Ecology* (CASE stands for Curriculum for Agricultural Science Education) is a five-day intensive training that is inquiry-based and integrates Science, Technology, Engineering and Math (STEM) principles throughout a year's worth of laboratory-based curriculum. Fifteen in-service teachers and five pre-service teachers are expected to participate in the institute, which will take place at Waverly High School in June. Teachers can apply to attend UNL's website. The CASE Institute is partially funded by Partnerships For Innovation, a statewide consortium that supports Career and Technical Education in secondary and post-secondary schools through scholarships to teachers across Nebraska.

2. *Present at the Nebraska Career Education Conference*

Program organizers would encourage participants to present at the 2021 NCE Conference, possibly also presenting at the fall NAEA Nebraska Agricultural Education Symposium in November of 2020.

3. *Report to the PFI Leadership Council either orally or in written format*

   Program organizers would be happy to report the success of the program to the PFI Leadership Council with a written summary or oral report. Additionally, welcome PFI Council Member and other LEAs to visit the professional development institute, including community college faculty and other interested partners.

Budget Plan

Budget Narrative: *Outline how the funding will be allocated based on the activity(ies) described and include any in-kind match (not required). Stipends for participation will not be granted; however, funds may be allocated to substitute teacher reimbursement.*

Participant Cost: The conference costs participants or their schools $2,500 to attend. This fee pays for the conference, including the CASE lead teachers and related supplies/laboratory equipment, the participant's room and board, including evening meals. The curriculum is provided free to teachers once they complete the training.

Financial Match: The project organizers to make additional funding sources available to participating teachers to help with supplies and equipment needed for teachers to fully execute the curriculum in their local schools. For the past eight years, the Nebraska FFA Foundation has raised funds to help with this support (2020 FFA Foundation funding is TBD). Additionally, we are requesting PFI funds to fund $2,250 of the $2,500 fee, meaning that local districts will have a net $250 investment to send a teacher to participate in the institute.

In-Kind Match: The Waverly High School will provide the classroom and laboratories needed at no cost. The time and efforts of UNL Faculty will also be donated as an in-kind match. Finally, both UNL and Waverly High School will provide select equipment and supplies at no cost.

Scholarships for Nebraska Teachers: Because CASE is a national initiative, teachers from other states can attend. PFI and other corporate sponsor dollars will only be applied to current, Nebraska in-service teachers' costs. The easiest way to do this is to provide scholarships to Nebraska in-service teachers, thus reducing only their costs for the Institute while maintaining the $2,500 fee for teachers from other states. The amount of each scholarship will total $2,250 per in-service teacher, leaving $250 to be covered by the local school district, leaving the school with a minor investment in the training/curriculum. The scholarship would be made to the entity (teacher or school) that pays the $2,500 participation fee. The scholarship can be used for reimbursement or professional development, or if the teacher indicates as such, be applied toward equipment and materials costs to facilitate the course at the local level. Teachers will also be directed to additional private funding sources to help cover local equipment and supply needs, such as through the Nebraska FFA Foundation and other national-level scholarships organized by the national CASE group.

Fixed Cost: PFI funds will be used to support a $500 administrative fee to Waverly high school.

Budget Table						
	Personnel: Stipends/Presenter Fees/Substitute Fees	**Supplies**	**Travel: Lodging, Mileage, Meals**	**Conference Expenses**	**In-Kind** *(not required)*	**Total**
Goal: To train and certify 15 secondary in-service teachers to teach the CASE *Natural Resources and Ecology* course through their completion of a five-day "fast track" CASE Institute in June 2020.						
Activity 1: Teacher Scholarships	$33,750 This includes 15 scholarships at $2,250 each for current in-service teachers. The total cost of the conference will be $2,500, however, it is desired that schools have some investment ($250). Pre-service teachers are not supported by PFI funds.	Note: Attending the CASE institute includes all related conference supplies.	Note: Attending the CASE institute includes all lodging and meal costs for participants.	Note: Attending the CASE institute includes all related conference expenses.	$9,750 This includes donated Waverly PS conference space and teaching equipment; donated UNL faculty time and supplies; and $3,750 of local school support not covered by the scholarship at $250/school.	$43,500
Activity 2: Fixed Cost		$500 (including a $500 administrative fee to Waverly PS)				$500
					TOTAL REQUESTED FROM PFI (after removing in-kind expenses):	**$34,250**

Other Ideas/Thoughts to Consider: *Share additional ideas or thoughts relating to the activity the PFI Leadership Council not previously highlighted.*

To learn more about CASE and the *Natural Resources and Ecology* course, visit this site:

- National CASE Site: https://www.case4learning.org/curriculum/case-courses/natural-resources-and-ecology

Additionally, CASE organizers offer the following context about the planned 2020 institute:

1. *Communicate how the model is replicable*

   Because CASE is managed by the National Association of Agricultural Educators, the model has been replicated across the United States. There are other courses available for future expansion for Nebraska's teachers, including

2. *Outline how the responsible parties will report-out results:*

   a. *Share with local Principals/Superintendents*
   Participating teachers will receive training on how to communicate the effectiveness of the curriculum with local stakeholders, including principals, superintendents and guidance counselors. Program organizers will also communicate the program directly to all AFNR programs' administrators.

   b. *Share the end results with activity participants*
   Program organizers will remain in contact with participants and arrange meetings at appropriate agricultural education meetings and conferences for continued support.

   c. *Share with the local community/media*
   Program participants will be required to show evidence of them sharing information about their experience in the CASE Institute with their local community. Acceptable evidence will include being featured in the local newspaper, school newsletter, or other approved methods. Teachers will be required to indicate that their support

Past Research of a Nebraska CASE Institute

While the following data is somewhat dated, it still may provide context about the impact that CASE Institutes can have for teachers. UNL faculty plan to complete an updated survey after the 2020 Institute.

Sydney Paige, a pre-service agricultural education teacher, surveyed the 2012 Nebraska Intro to AFNR CASE Institute teacher participants. The following data represents partial results of Ms. Paige's research:

Question	Average	Range
Rate the accessibility of resources such as lab supplies for implementing CASE in your classroom.	3.4 (+/- 1.52)	2-5
Rate the accessibility of monetary support for implementing CASE in your classroom.	3.4 (+/- 1.26)	2-5
Rate your confidence in delivering the content and lessons presented in CASE.	3.9 (+/- 0.70)	3-5
Rate your overall satisfaction with the curriculum so far.	3.3 (+/- 0.95)	2-5

How is your program handling the start up cost for CASE curriculum? i.e. What is the source for your funds for the curriculum, workshops and supplies?

- *The curriculum and training was covered through grant funds at the state level. I am currently working on getting grants and accumulating funds to get some of the necessary supplies.*
- *I have used some of my department budget money, I have applied for grants, & the school is supplying an additional $4000 for materials.*
- *Without the scholarships made available through the Nebraska FFA Foundation [and PFI], I probably wouldn't have attended, as the cost is prohibitive to myself as well as my school. I'm still struggling to find funding for the equipment.*
- *I was very fortunate in this area. I received a $2500 grant from Pioneer to purchase materials. The school then matched the funds. With the money, I purchased 5 LabQuests, and all of the sensors needed for the curriculum. (Our science department had a few of the needed sensors.) The scholarship paid for the training and then the school paid the rest of the curriculum.*

What are some thoughts you would like to share about the initial implementation of CASE in your curriculum from a teacher's perspective? (challenges, benefits, likes, dislikes etc.)

- *I like the curriculum, but have not utilized it fully since I am still trying to find funds to get all the necessary supplies.*
- *I have 25 students in the class and the challenge comes in trying it out for the 1st time, but students are responding well.*
- *I think the CASE curriculum is good that is forces kids to think outside the box, however, some of the curriculum may be too advanced for the freshman level and special education students. The days they have allotted for some of the lessons usually take longer than 45 minutes and more days to get things through.*

CASE was developed to reflect a philosophy that promotes rigor and relevance for students, reflect on the impact that CASE has made on your students? What challenges have your students experienced? What benefits?

- *Some students struggle to read and follow instructions. I like that CASE has detailed instructions that often should be able to be interpreted by the student. Some students struggle with the not having only one right answer.*
- *It will be challenging for students. The rigor & relevance is appropriate for freshmen level students.*
- *I think that this course is good for freshmen. It is stuff that they can do on their own and still learn from it. The biggest problem I have with this curriculum is the flow of it. I just finished the pH section in the agriscience unit, and cells and DNA are next. I have a hard time relating them together and helping the kids understanding e big jump between topics. The students really do enjoy getting out to the lab and working on labs rather than taking notes all the time.*

CASE

Project 6.1.2 Vegetation Relevé

Purpose

Plants not only are a large component of most ecosystems, but the survival of plants also impacts the survival of animals and humans. Perhaps you walk or drive by a wooded area, a meadow, or even a swamp. Have you noticed the plants that occupy the area? If the area is relatively undisturbed, it is likely that the same plants are visible to you month after month or even year after year.

You already know that plants are primary producers in ecosystems providing energy for herbivores, which in turn provide energy to carnivores. Each plant or plant community in an ecosystem may also play an additional role. For example, large trees create shade that is the perfect environment for many smaller, understory trees. Thick shrubs provide cover for herbivores from carnivores.

In order to better understand plants and plant habitat, it is useful to conduct surveys to identify and categorize plant material in representative plots. A relevé (pronounced rel"u-vā') is French for notes. Relevés are closely associated with a procedure for describing and classifying vegetation that has a long history of development and use among plant ecologists. A relevé is an organized list, developed through a specific process that includes identifying and categorizing plants by canopy height, coverage, and area.

Materials

Per team of three students:

- GPS unit
- Meter stick
- Metric tape measure
- Stakes
- String
- Water bottle
- Trowel
- Clipboard
- Hammer
- Bucket
- Flags or surveyors marking tape
- Local plant classification guides

Per student:

- Pencil
- *NRE Notebook*
- Safety Glasses

Procedure

In this project, you will study both the plants and habitat for an area near your school and develop a relevé (a plot that encloses the minimal area under a species-area curve). Use the *Project 6.1.2 Evaluation Rubric* to guide your work.

Part One – Plot Selection

1. Review the *Vegetation Relevé Key*, *Site Data Sheet*, and *Vegetation Data Sheet* to prepare for collecting field data.
2. Gather the materials listed above and place them in the bucket.

3. Identify a plot using the following criteria:
    - The plot is representative of the area as a whole.
    - The plot is uniform in vegetation composition and structure.
    - The vegetation in the plot area is ecologically intact and has not been visibly disturbed by human-related activity such as recent logging, heavy grazing, or invasion by non-native species.
    - The plot is not close to any noticeable boundary between different types of vegetation.
    - The plot measures a minimum of 10mx10m or 20mx20min upland forests, woodlands, savannas, and forested wetlands or a minimum of 5mx5m or 10mx10m if in prairies, shrub swamps, and open wetlands.
4. Wear your safety glasses. Using the stakes and flags provided, mark the corners of your selected plot area by hammering a stake in each corner. For irregular shaped areas, use tape and flags to mark additional points as needed. Use the string to mark the boundaries in brushy areas.
5. Begin to fill in the *Site Data Sheet* with the general and site information.
6. Set up the GPS and record the latitude and longitude of each corner.
    - Once you are outside turn on the LabQuest2. Tap **Sensors**. Select **GPS** on the Sensor Setup screen. Tap **OK**. Allow the GPS to locate satellites and establish your position.
    - Record the GPS location for each corner of your plot and record in your location information.. Use all of the decimal places given on the GPS. A properly recorded GPS location looks like this: Latitude 45.47095º Longitude -122.89172º. Include all decimals places provided on the GPS.
7. Record the plot and soil information using the *Vegetation Relevé Key* as a guide. Identify the soil texture type. Use the soil flowchart from *Activity 2.1.2 The Feel of the Soil* if necessary.
8. Sketch the plot area you have identified. Be sure to record and describe land features that can provide good reference points. Sketch the general areas of grasses, herbs, shrubs, and trees. Record the latitude and longitude at the corners and indicate the direction of north. Include a scale on the map.

Part Two – Plant Identification

1. Begin the process of surveying the plants within your plot by walking through the entire plot to get a sense of the plant species, topography, and habitat.
2. Next walk the plot in the pattern described to survey the plants represented.
    - Begin at the first corner, walk just inside the plot boundary toward corner #2, and identify the plants as you encounter them in the plot.
    - Record each plant in the appropriate category in the *Vegetation Data Sheet* and add new plants as you encounter them. Plants inside the border are counted in. Plants rooted outside the border but with branches extending over the sides of the plot are also included in the sample.
    - Continue walking the plot, proceeding past corners 2, 3, and 4. After passing corner #4 proceed about 1/3 of the way between corner #1 and corner #4, and then cut through the plot to the opposite side. When you get to the opposite side, move down another 1/3 of the side and cut through to return to corner #1.
    - The plant inventory step should now be complete. Note any unidentified plants you encounter by coding them: unidentified A, B, and so on. There is no need to collect any plants.
3. Identify plants, starting with the tallest plants, entering the data in the *Vegetation Data Sheet*. Refer to the codes found in the *Vegetation Relevé Key* as you enter data. In order to save space, use the codes provided.
4. Complete identification of all plants located in your plot.

Part Three – Present and Compare

1. Post your *Vegetation Data Sheet* and *Site Data Sheet* as directed by your teacher.
2. Study the tables posted by all groups. Review the differences and similarities between the class plots and the plot you studied, and answer the analysis questions on the student worksheet.

Conclusion

1. How did the vegetation within your plot vary? Why do you think this is so?

2. What did you learn about your plot that was most surprising?

3. What tools were most useful during your survey of the plants and habitat of your plot?

Site Data Sheet

General Information

Surveyors _____

Date _____ Site *Location* _____

Vegetation Information

Vegetation Group *(circle one)*

(WU) wooded upland (OU) open upland (WW) wooded wetland (OW) open wetland

Location Information

County _____ *Permanent Marker* Yes No

Coordinates (use GPS to mark corners) *Marker Placement* _____

NE _____ NW _____

SE _____ SW _____

Plot Information

Plot size _____ m x _____ m = _____ m^2

Elevation _____ ft *Slope* _____ ° or % (indicate)

Topographic position *(circle one)*

Crest Upper Middle Lower Toe Flat Depression Uncertain

Soil Information

Litter thickness _____ cm

Litter type *(circle one)*

Leaves Needles Grass Other _____

Humus thickness _____ cm

Humus type *(circle one)*

Mor Moder Prairie mull Wormed mull

Earthworms present Yes No

Soil texture *circle one*

S LS SL L SIL SCL CL SICL SC SIC C RO

Soil drainage class *(circle one)*

Excessively Well Moderately well Somewhat poorly Poorly Very poorly

Depth of standing water _____ cm

Remarks

Site Sketch

Vegetation Data Sheet

Genus, species	Life Form	Height Class	Cover	Sociability	Reliability	Remarks

Analysis Questions

1. How does the biodiversity of your plot compare with biodiversity of the other plots? Explain your reasoning.

2. In which site information categories (vegetation, location, plot, and soil) from the *Site Data Sheet* is your plot similar to other plots?

3. In which site information categories (vegetation, location, plot, and soil) from the *Site Data Sheet* is your plot different from other plots?

4. Can you detect patterns between the varying site characteristics and biodiversity?