ACADEMIC PROGRAM PROPOSAL FORM

(*Revised: May 2019*)

DIRECTIONS: *Use this form when proposing a new major or primary field of study, new emphasis (BAS only), or new degree or certificate (30+credits) program.* ***For more detail on the NSHE program approval process, see the last page of this form.***

DATE SUBMITTED: August 14, 2020

INSTITUTION: UNR

Date of AAC Approval:
09-09-20

Date of Board Approval:

REQUEST TYPE:

- ☐ New Degree
- ☒ New Major or Primary Field of Study
- ☐ New Emphasis (BAS only)

DEGREE: Check applicable box

- ☐ Certificate: 30+ Credits
- ☐ Associate of Science (AS)
- ☐ Associate of Applied Science (AAS)
- ☐ Bachelor of Arts (BA)
- ☐ Master of Science (MS)
- ☒ Doctor of Philosophy (Ph.D.)
- ☐ Associate of Arts (AA)
- ☐ AA/AS
- ☐ Bachelor of Applied Science (BAS)
- ☐ Bachelor of Science (BS)
- ☐ Master of Arts (MA)
- ☐ Other or Named Degree:_____

MAJOR OR PRIMARY FIELD OF STUDY (i.e. Animal Science): Natural Resources and Environmental Science

INCLUDED IN LAST NSHE PLANNING REPORT: ☒ Yes ☐ No
(Website for NSHE Planning Reports: https://www.nevada.edu/ir/page.php?p=planning)

TOTAL NUMBER OF CREDITS TO PROGRAM COMPLETION: 72

PROPOSED SEMESTER/TERM OF IMPLEMENTATION: Spring, 2021

Action requested (specify full program title):
Approval of a PhD program in Natural Resources and Environmental Science.

A. Brief description and purpose of proposed program. For proposed certificates (30+ credits), provide any existing degree or program under which the certificate falls.

We are proposing the establishment of a PhD program in Natural Resources and Environmental Sciences. This program addresses the need for professionals trained in the use of data-driven approaches and applications to address issues impacting the management of natural resources.

Natural resource management and environmental science are fundamental to the production of food, fuel, fiber, as well as guaranteeing water and air quality, and for the sustainability of ecosystems. Given many conflicting anthropogenic pressures and management objectives for our natural resources, we must train scientists who can study the natural world and provide data-driven, actionable information to policy makers, land managers and owners, and the general public. In particular, we need to train scientists who will foster strong relationships between different stakeholder groups, and who will have the skills and resources to bring emerging science into the decision-making discourse.

PhD students in NRES will be prepared to engage with their professional community, with stakeholders who manage natural resources, and with the broader community in which they work and reside. PhD students from our proposed program will tackle cutting edge academic questions with their research, but their work will have an applied focus that connects them to stakeholders, management and policy decisions in a manner that is unique amongst other programs at UNR. Students in our program will become experts in "translational science," which moves beyond interdisciplinary, cross-cutting research to include the stakeholders and managers that will benefit from the research from project initiation, through publication of the research, and into the communication of this science to the non-academic community. The Department of Natural Resources and Environmental Science (NRES), in the College of Agriculture, Biotechnology & Natural Resources (CABNR), is well positioned to train PhD scientists with this knowledge, experience, and skillset.

B. Provide a list and description of institutionally approved expected student learning outcomes

The NRES PhD Program will prepare students to address critical regional and global needs in natural resource ecology and management, as well as more broadly in the field of environmental science. There is high demand for students with this training (see Part E below). Students will be able to:

- Design and implement independent scientific research that creates and integrates core scientific knowledge to address the sustainable management of natural resources.
- Apply rigorous statistics/analytical methods that typify their area of study.
- Demonstrate effective communication skills (written and oral) that are typical for the field, including presentations, publications and proposal writing.
- Develop professional skills including data management, development of funding opportunities, mentoring, scientific collaboration, and networking.
- Gain teaching experience
- Develop proficiency and familiarity with grant and fellowship applications.

C. Provide an institutionally approved plan for assessing student learning outcomes

We will closely monitor the achievements and progress of all students enrolled in the NRES PhD Program via annual meetings and written evaluations (see below for details). Beyond this we will conduct exit interviews and maintain professional relationships with our graduating students, keeping regularly updated records of their career successes and progress. We will also track the reasons that any students provide about why they have to leave the program prior to graduation.

Specifically, success in achieving the learning outcomes and program objectives listed above will be assessed by evaluating the following milestones of the PhD program:

- Quality of the written and oral comprehensive exams, prior to achieving candidacy.

- Originality and quality of the PhD thesis.
- Oral presentation of thesis research to the department.
- The graduation rate and years-to-graduation for the program overall.

At the beginning of their program, students will develop and present an Individual Development Plan stating:

- Their professional and career goals.
- A list of proficiencies that the student intends to achieve during their time in the NRES Graduate Program including but not necessarily limited to the program objectives (Section B) and an explanation of how these proficiencies will help the student achieve their professional goals.
- Timeline for achieving all program requirements and desired proficiencies, organized as a set of annual expectations.

We will treat each IDP as a living document that will be updated throughout a student's tenure. At the end of each academic year, each student will work with their advisor to revise their IDP for the coming year, and will submit their updated, signed IDP to the Graduate Program Director for approval. Each student (working with their advisor) will also submit a brief progress evaluation documenting the degree to which each of the stated annual expectations were met. Student IDPs and progress evaluations will be assessed by their advising committee along with their plan of study (coursework). Candidates will also complete a written and oral comprehensive examination created by their advising committee and present their dissertation defense for an open audience. These opportunities provide faculty with an opportunity to assess the development of each student and to adapt the program as needed to achieve or improve success in meeting the program objectives (Section B).

D. Contribution and relationship of program objectives to

i. NSHE Master Plan / Strategic Goals

a. Access – *Increase participation in postsecondary education*

Adding a PhD degree to our existing NRES Graduate Program will increase participation in postsecondary education by the following means:

- Provide an academic structure for students participating in emerging collaborative, cross-disciplinary projects among faculty and labs within the department.
- Increase our ability to attract high-quality PhD students, especially those that do not fit well in existing interdisciplinary PhD programs on campus.
- Enable the department to increase the number of its PhD students by providing an avenue for NRES MS students to continue their studies at the PhD level.
- Improve the "learning community" for other NRES graduate students through an expanded and improved curriculum and seminar series that would go along with the creation of a PhD program.
- Provide important visibility and prestige to NRES, CABNR, and UNR which is a key part of UNR sustaining "R1" status.
- Provide flexibility and control to the faculty of NRES in terms of curriculum and testing requirements as well as directing graduate resources.

b. Success – *Increase student success*

We will closely monitor the achievements and progress of all students enrolled in the NRES PhD Program via annual meetings and written evaluations (section D). Beyond this we will conduct

exit interviews and maintain professional relationships with our graduating students, keeping regularly updated records of their career successes and progress. We will also track the reasons that any students provide about why they have to leave the program prior to graduation.

Specifically, success in achieving the learning outcomes and program objectives listed above will be assessed by evaluating the following milestones of the PhD program:

- Quality of the written and oral comprehensive exams, prior to achieving candidacy.
- Originality and quality of the PhD thesis.
- Oral presentation of thesis research to the department.
- The graduation rate and years-to-graduation for the program overall.

The NRES Graduate Program and Curriculum Committee will monitor and modify the curriculum as needed to fulfill the program objectives

c. Close the Achievement Gap – C*lose the achievement gap among underserved populations*

One of the challenges to close the achievement gap is that there is significant filtering that goes on before a student is even ready to apply to a PhD program. As such, our department is focusing on the following goals to close the achievement gap:

- At the undergraduate level, our department has implemented a mentorship program to help students apply to graduate school, which should help increase the number of students entering the pool.
- Our department has implemented, to our knowledge, a first-on-campus required statement of goals and annual evaluation for our Master's students, which will also apply to our PhD students. This should reduce the effects of implicit biases by having the advisor and student work together to clearly set annual goals for their time in the program, evaluate them on how well they accomplished these goals, and repeat the process every year.
- Our department has implemented, to our knowledge, a first-on-campus program to make full funding offers to MS and PhD students (2 years for MS and 4 years for PhD). This should reduce the anxiety for economically disadvantaged students, since their funding is spelled out before they accept the offer, and is reserved for that student for the duration of their time in the program.
- Our graduate program (the existing NRES MS as well as the proposed PhD program) will leverage the UNR Graduate Schools Gradventure program to improve recruitment of underrepresented students from minority-serving institutions such as Nevada State College, Western Nevada College, and the College of Southern Nevada.

d. Workforce – *Collaboratively address the challenges of the workforce and industry education needs of Nevada*

Nevada has a higher fraction of lands under government operation than any other state in the union, with the federal government (Bureau of Land Management, U.S. Forest Service, Department of Energy, Department of Defense, and others) managing over 56 million acres (81% of the total land area). This land is managed for multiple uses including outdoor recreation, mining, agriculture, military training and wildlife – and well-trained natural resource professionals are critical for ensuring that these land management objectives are met safely and sustainably. Even beyond the state's vast public lands, environmental planning and management professionals (employed by state agencies and private consultancies) are needed to ensure that industrial and residential development are carried out in a sustainable and responsible manner.

In the last decade, the Environment, Conservation and Wildlife Organizations have seen a 287% increase in the number of jobs and Environmental Consulting Services have seen a 102% increase in jobs (https://goed.nv.gov/wp-content/uploads/2018/07/natural-resources-1.pdf). Due to the specialized and highly technical nature of the work, many government agencies and environmental consulting firms are preferentially hiring candidates with PhD degrees in Natural Resources and Environmental Science.

e. Research – *Co-develop solutions to the critical issues facing 21st century Nevada and raise the overall research profile*

The NSHE Master Plan calls for "Addressing the challenges of the workforce and industry education needs of Nevada", and "Develop solutions to critical issues facing 21st century Nevada and raise the overall research profile". The proposed PhD in NRES addresses both goals as it enhances training opportunities for students who can be employed in both public and private sector jobs in Nevada. In addition, the graduate program involves faculty who are actively engaged in local and regional studies directly addressing existing and emerging issues in Nevada including wildfire, drought, water resources, wildlife habitat modification, climate change and rehabilitation and restoration of degraded lands.

ii. Institutional mission and core themes

As defined in the 2015 strategic plan, the primary mission of the University of Nevada, Reno is to "Improve lives of citizens of Nevada through exploration and engagement with a 21st century approach to the land-grant mission" and "Increase the number of graduate teaching and research assistant lines in PhD-granting programs". The proposed doctoral program directly supports the mission by providing training in a field that is not only relevant, but critical to addressing many of the environmental challenges facing the state, the nation, and the globe. In addition, the proposed PhD program fills a critical void in terms of a focus area that is currently not covered by existing graduate programs, and as a result, is likely to attract new students.

The proposed graduate program will involve a large number of faculty whose research activities are directly focused on stewardship of our natural resources. Our teaching, research and extension activities will serve the economic, social, environmental, and cultural needs of the citizens of Nevada, the Nation, and the World through our emphasis and current leadership in natural resources management. We will continue to embrace the critical importance of diversity in preparing students for global citizenship and we are committed to a culture of excellence, inclusion, and accessibility.

iii. Campus strategic plan and/or academic master plan

The proposed NRES PhD program addresses several needs identified in the 2015 – 2021 UNR Strategic Plan:

Theme 1 (Learning) Goal 3 (Provide high-quality graduate programs taught by research-active faculty). In particular, our proposed program fits in with "strategic development of new PhD programs". The new program will also increase UNR's graduate enrollment and enhance our students' experience.

Theme 2 (Discovery) Goal 1 (Enhance the quality, value, and range of the University's research and artistry. Attain classification as a "Carnegie R1" institution.) Although the Carnegie R1 status has been achieved, our proposed program will continue to increase research productivity in the department and likely in other UNR programs that participate in the training of our PhD students.

The PhD program will also enhance the ability of NRES faculty to acquire grant funding from external agencies to support research and graduate student education.

Theme 2 (Discovery) Goal 2 (Invest in disciplinary and interdisciplinary research areas that build upon existing strength and that are responsive to emerging needs and opportunities). The proposed program will be highly interdisciplinary and covers several specific topics listed in the strategic plan including: advanced autonomous systems, agriculture, environmental studies, Great Basin studies, integrated earth systems and renewable energy. While existing programs cover aspects of these topics, the NRES PhD program will be unique in its multidisciplinary approach.

Theme 3 (Engagement) Goal 1 (Develop and adopt a unified concept and vision for the University's public engagement and land-grant mission). Public engagement is a crucial part of much of the work that NRES faculty carry out. Consequently, NRES PhD students will have unique opportunities to become involved in public engagement activities, thereby training the next generation of scientists who will be well-versed in these activities.

iv. Other programs in the institution

We anticipate that many of the graduate classes offered through the Natural Resources and Environmental Science Department will better achieve critical mass with enrollment of NRES PhD students. Furthermore, the NRES faculty will be able to offer graduate classes of value to students of other departments including Agriculture, Veterinary and Rangeland Sciences; Biology; and Geography. Creation of this program will allow students to pursue a degree program that better fits their needs and will be recognized as such by their future employers. The interdisciplinary nature of the NRES PhD program will allow students to participate and interact in core disciplines offered by the following programs: MS and PhD in Animal and Rangeland Sciences, MS and PhD in Atmospheric Science, MS and PhD in Biochemistry, MS in Biology, MS and PhD in Cellular and Molecular Biology, MS and PhD in Ecology, Evolution and Conservation Biology, MS and PhD in Environmental Sciences and Health, MS and PhD in Geography, MS and PhD in Hydrology, and MS in Nutrition. We note that our proposed course requirements do not overlap significantly with existing graduate programs. Our faculty would continue to contribute students to interdisciplinary programs at UNR such as Hydrologic Sciences, Ecology, Evolution and Conservation Biology (EECB), and Environmental Sciences, but would now have an additional, departmentally focused option to attract new students with more applied research and career interests.

v. Other related programs in the System

There is no closely related PhD program within NSHE that focuses on the more applied aspects of natural resource sciences. UNLV supports MS and PhD programs in Biological Sciences that have an Ecology and Evolutionary Biology track. These programs are thematically close to UNR's existing Ecology, Evolution and Conservation Biology (EECB) interdisciplinary graduate program. However, this program does not overlap significantly with our proposed NRES PhD program. The NRES PhD program will emphasize applied environmental science and natural resource management, and as such will need to be inclusive of multiple scientific disciplines outside of biology, including physical sciences such as hydrology, atmospheric science and chemistry, as well as social sciences such as environmental policy and environmental law. A hallmark of our program will be interdisciplinary training towards the goal of science-based management of natural resources and environmental sustainability.

E. Evaluation of need for the program

i. The need for the program and the data that provides evidence of that need

The new PhD program in Natural Resources and Environmental Science will be strongly supportive of the land-grant mission of the University of Nevada. Broadly, the Mission seeks to provide applied scientific knowledge of importance to the state and region in which the University is located. The establishment of an NRES PhD program will ensure graduates have the highest level of training in environmental science and management to be able to leave, after completing their dissertations, to fill natural resource positions that require or would benefit from a PhD-level training. The students in this program will assist in building a culture of excellence within the NRES department and will provide a crucial nexus to build a community with existing NRES MS students.

Evidence of existing or projected local, state, regional, national and/or international need for program: Evidence for the need for this program comes partly from discussion between NRES faculty and our stakeholder groups. Our stakeholders represent the diversity of our research, and include: US Forest Service, US Bureau of Land Management, US Fish & Wildlife Service, NV Dept of Wildlife, US Geological Survey, CA Dept of Fish & Wildlife, The Nature Conservancy, Truckee Meadows Water Authority, USDA Agricultural Research Service, USDA Natural Resources Conservation Service, NV Division of Forestry, and the NV Dept of Environmental Protection. We commonly note that our collaborators in public agencies and non-governmental organizations alike rely on the best-available science to make decisions and take management actions. Increasingly, these stakeholder groups are looking to hire PhDs in order to take advantage of their knowledge base and connections to the research world, if not to build internal research capacity. The success of our graduate students at obtaining work after graduation (noted elsewhere in this application) demonstrates the clear need for new hires with advanced degrees in the region.

An NRES PhD program would help meet the unique needs of our state and region. Presently, similar programs exist in other United States land-grant institutions, yet natural resource management and science in those states and regions are different from those in Nevada, the Great Basin, and the Sierra Nevada. UNLV, at present, does not have a PhD program in NRES. The region would benefit from graduates with the knowledge and tools to be applied scientists for the stakeholders that are actively managing lands.

From the Food and Agricultural Education Information System database for the 2018 academic year (https://faeis.cals.vt.edu/), we derived the total number of PhD students who belong to "Natural Resource and Conservation" departments for each available institution. Across all universities in the database, the average number of PhD students was 47, but UNR only has 26 PhD students, ranking 35th in size amongst 49 universities which, for a university of our size, clearly shows room to grow. We note that at UNR Hydrology and Environmental Sciences PhDs are classified as part of Natural Resource and Conservation.

ii. Student population to be served

The program will provide a degree opportunity to students that have a broad range of possible career trajectories after graduation: academia or other full-time research position, government positions, or positions in NGOs. UNR presently loses PhD students seeking these natural resource-related professional opportunities to other universities. A PhD program will provide an opportunity for students in the NRES MS program to advance their degree should they realize, after matriculation, that a PhD might be a good opportunity for their professional development. As the NRES department continues to develop its research program, faculty in the department will recruit new PhD students who will be candidates to the program.

iii. Procedures used in arriving at the decision to offer the program

A vote was held by the department in April of 2019 in which a supermajority of faculty agreed on the value of starting a PhD program. After this vote, we created a PhD Proposal Committee including seven (7) of the twenty (20) faculty members in the department. Multiple faculty meetings were held to discuss the proposal, and all faculty were given the opportunity to contribute to the final proposal.

iv. Organizational arrangements required within the institution to accommodate the program
N/A

v. The timetable, with dates, for implementation steps

Assuming a Spring 2021 implementation date:

Fall 2020:
A draft handbook, curriculum and funding procedures will be created based on the NRES MS handbook with the additional PhD requirements and sent to the faculty for their approval. Most of this preliminary work has already been completed in preparation for a PhD.

Department chair assigns responsibility for the creation and teaching of NRES 7xx, Research Methods and Applications in Natural Resources and Environmental Science (3 credits) to be moved through UNR's online curriculum tracking system with a target starting date of Fall 2021, and offered every Fall thereafter.

Following final approvals for the program, the program website will be developed and marketed in online forums as well as conferences in the Winter (e.g. AGU). First applications are received.

Faculty push to recruit students.

Spring 2021: First students arrive.

vi. If this or a similar program already exists within the System, what is the justification for this addition

There are other graduate programs at UNR that are associated with the study of the natural world - namely, the interdisciplinary programs in Ecology, Evolution, and Conservation Biology; Hydrology; and Environmental Science. Many NRES faculty are active members of these programs, and yet we also see the benefit of a new program that increases the capacity to train Ph.Ds. A PhD program in NRES does not prevent students with appropriate interests and projects from matriculating in one of these interdisciplinary programs. Rather, we envision the NRES PhD program to be one in which the student population is addressing applied, management-focused scientific questions - with an eye towards possible careers in academia or research, but also other likely career paths outside of the "traditional" PhD positions. Such nontraditional career paths for NRES PhDs include working within the private sector (e.g. environmental consulting; science writing), for nonprofit organizations (environmental advocacy, environmental education, etc.), or as natural resource managers for local, state and federal agencies. We expect the NRES PhD students would interact with their peers in the other interdisciplinary programs while forming the core of a community focused around our department and our graduate program.

vii. Evidence of employment opportunities for graduates (state and national). Include information on institutional review of the need for the program based on data from the Nevada P-20

Workforce Research Data System (https://www.nevada.edu/ir/strategic_plan.php?metric=spm4&mid=workforce_demand), including the supply/demand reports at http://npwr.nv.gov/reports/student-completion-and-workforce-part-ii/.

Graduates of the NRES MS program have been highly successful in finding positions in their fields of study. Of 50 students who have graduated since 2010, and for whom information is available, 92% now have careers that are relevant to their graduate studies. Many of these (40%) are employed in academia at various levels, ranging from PhD students (14%) to tenure-track faculty (6%). The largest numbers of our graduates (18%) are employed as managers or scientists in the federal government, with an additional 8% working for state agencies and 4% working for county agencies. Job titles for those with government agency careers include: environmental scientist, wildlife biologist, forest botanist, Nevada state botanist, ecologist, natural resources specialist, biologist, and non-game wildlife biologist. Another 12% of our former graduate students work in the private sector for NRES-relevant companies (mainly as environmental consultants), and 8% work for non-profit organizations. Those with NGOs serve as field crew supervisors, rangeland ecologists, and restoration ecologists. The Nevada P-20 Workforce Research Data System shows that 100% of Natural Resource and Conservation PhDs get employment in NV, with an average wage of $149,000 per year, showing a clear demand for the degree.

F. Detailed curriculum proposal

i. Representative course of study by year (options, courses to be used with/without modification; new courses to be developed)

Our credit requirements will follow the UNR standards for a PhD as described in https://www.unr.edu/Documents/graduate-school/program-of-study.pdf:

- Minimum of 72 graduate credits
- Minimum of 48 graduate credits of coursework
- Maximum of 24 graduate credits from a completed master's degree program or previous post-baccalaureate work may be applied to program (this includes grad special, transfer, the total can not be more than 24 credits)
- Maximum of 9 graduate credits of S/U grading (including transfer credits)
- At least 30 credits of 700-level graduate credits exclusive of dissertation credits are required: as many as 18 of these credits may be used from a masters degree program
- Doctoral Students must enroll in a minimum of 24 dissertation credits for degree completion
- Fulfill residency requirement; two consecutive semesters (fall/spring or spring/fall) of at least nine (9) graduate credits each; (students on 20 hr/week assistantships require six (6) credits each semester (fall/spring or spring/fall)
- All requirements for the doctoral program, excluding prerequisite graduate course work or masters degrees, must be completed within a period of 8 years immediately preceding the granting of the degree.

NRES PhD students will be required to take NRES 7xx, Research Methods and Applications in Natural Resources and Environmental Science (which will be a new course that will be developed), six (6) credits of quantitative coursework at the 600 or higher level, and four (4) credits of a committee-approved seminar series. In addition, NRES PhD students will be required to fulfill a teaching requirement that can be met by taking a course in instructional methods, having a Teaching Assistantship with a significant instructional component, by serving as an instructor of record, or by

having previous professional teaching experience. Beyond this, the NRES PhD degree is intended to be "committee-driven" where the student has flexibility to select most courses and develop a program of study under the guidance of an advisory committee.

The advisory-examining committee consists of at least five graduate faculty members. In addition to the permanent advisor as chair, this committee is composed of two or more members from the major department, one or more from departments in related fields, and at least one member of the graduate faculty from outside the student's major department or program who is the Graduate School Representative.

Representative course of study by year:

***Assumptions for this representative course of study*:** Master's degree prior to entering with 18 transferable graduate credits, and a goal of graduation in four (4) years.

Fall, Year 1:
- NRES 7xx, Research Methods and Applications in Natural Resources and Environmental Science (3 credits) - new course to be developed
- 7xx quantitative course, e.g. NRES 710 Graduate Environmental Statistics, NRES 746 Advanced Analysis methods for Natural Resources and Environmental Science, NRES 7xx Hierarchical Modeling for Natural Resources (3 credits)
- Colloquium (1 credit)

Spring, Year 1:
- NRES 7xx disciplinary course (3 credits)
- 7xx quantitative course, e.g. STAT 757, Applied Regression Analysis (3 credits)
- Colloquium (1 credit)

Fall, Year 2:
- NRES 7xx disciplinary course (3 credits)
- GRAD 702, Effective Teaching Practices in Higher Education I (3 credits)
- Colloquium (1 credit)

Spring, Year 2:
- NRES 7xx disciplinary courses (2 x 3 credits)
- Colloquium (1 credit)

Fall, Year 3:
- NRES 7xx disciplinary courses (2 x 3 credits)
- Colloquium (1 credit)

Spring, Year 3:
- NRES 799 dissertation credits (8 credits)
- Colloquium (1 credit)

Fall, Year 4:
- NRES 799 dissertation credits (8 credits)
- Colloquium (1 credit)

Spring, Year 4:

- NRES 799 dissertation credits (8 credits)
- Colloquium (1 credit)

Courses will be selected to complement the student's fields of interest and enhance his/her conceptual and research skills. Several existing 700 level courses will contribute to the course of study for students enrolled in an NRES PhD program. They include:

Statistics:

NRES 710 - Graduate Environmental Statistics
NRES 746 - Advanced Analysis Methods for Natural Resources and Environmental Science
NRES 7xx - Hierarchical Modeling for Natural Resources

Seminar courses:

NRES 735 - Plant Ecology Seminar (aka Plant Talk)
EECB 794 - Ecology, Evolution and Conservation Colloquium
NRES 782 - Hydrology/Hydrogeology Seminar
GEOG 690 - Geography Colloquium
ATMS 790/NRES 701C - Graduate Seminar in Atmospheric and Environmental Sciences

Disciplinary courses:

NRES 600 - International Issues for Water Development
NRES 602 - Forest Management
NRES 605 - Silviculture
NRES 606 - Ecophysiology of Forest & Range Plants
NRES 607 - Forest and Range Measurements
NRES 609 - Forest Management and Restoration
NRES 610 - Compliance with the National Environmental Policy Act
NRES 611 - Remote Sensing: Principles and Applications
NRES 612 - Environmental Law
NRES 621 - Conservation Biology
NRES 622 - Soil Physics
NRES 632 - Advanced Environmental Toxicology
NRES 633 - Environmental Chemicals: Exposure, Transport and Fate
NRES 640 - Wetland Ecology and Management
NRES 670 - Applied Population Ecology
NRES 682 - Small Watershed Hydrology
NRES 685 - Special Topics
NRES 693 - Forest Ecology
NRES 695 - Fire Ecology and Management
NRES 697 - Forest and Range Soils
NRES 701D - Hydrology
NRES 702 - Soil Biogeochemistry
NRES 720 - Survivor Skills for Graduate Students in the Sciences
NRES 721 - Molecular Ecology I: Theory and Applications
NRES 722 - Molecular Ecology II: Techniques and Analyses
NRES 725 - Plant Physiological Ecology
NRES 730 - Interdisciplinary Modeling
NRES 750 - Ecological Theory and Restoration
NRES 760 - Foundations of Ecology
NRES 765 - Biogeochemical Cycles

NRES 775 - Landscape Ecology
NRES 777 - Microbial Ecology
NRES 778 - Elements of Research Computing
NRES 780 - Analysis and Modeling of Animal Populations
NRES 784 - Vadose Zone Hydrology
NRES 791 - Special Topics in Environmental Sciences and Health
NRES 7xx - Earth System Science and Global Change
NRES 7xx - Advanced Remote Sensing

Dissertation credits:
NRES 799

ii. Program entrance requirements

Students who seek admission to the program should have a cumulative grade-point average of 3.0, a combined verbal and quantitative GRE score of 300, and, for international students, a TOEFL score of 600 (paper version), 250 (computer version), or 100 (internet version). Students must have an advisor among the NRES faculty before they are accepted into the Program. Students must meet a set of coursework requirements consistent with career objectives in a relevant natural resources and environmental science field. Required undergraduate classes must be taken prior to admittance or while in their graduate program.

iii. Program completion requirements (credit hours, grade point average; subject matter distribution, preprogram requirements)

Candidates for the PhD in Natural Resources and Environmental Science must satisfy the general requirements of the Graduate School. Students must select a PhD graduate advising committee consisting of at least five members of the graduate faculty, including the advisor, at least one other member from NRES, a member representing a closely allied discipline to the area of specialization, and one member serving as the Graduate School Representative. Students must present a dissertation proposal within their second year. See section G.a. above for details on the coursework and credit requirements.

Students will take and pass a comprehensive examination (for 1 credit) in order to be admitted into Candidacy for the Doctoral Degree. The comprehensive examination will be developed and administered by the student's advising committee, and will consist of a written and orals component.

Each candidate will write and defend in public their dissertation. The student's advising committee will pass judgement about the quality and sufficiency of the dissertation and its defense. The dissertation must also be accepted by the Graduate School.

iv. Accreditation consideration (organization (if any) which accredits program, requirements for accreditation, plan for attaining accreditation - include costs and time frame)
N/A

v. <u>For certificates only:</u> Name of any state, national and/or industry recognized certification(s) or licensing examination(s) for which certificate prepares the student, if applicable
N/A

G. Method of Delivery (for the purpose of state authorization [NC-SARA])

i. How will this academic program be delivered when the program begins? (mark all that apply)

- ☒ **100% face-to-face courses**
- ☐ **Hybrid (some online courses, some face-to-face courses)**
- ☐ **100% online courses**

ii. Learning Placements

Does the academic program have learning placements (e.g. internships, externships, clinical placements, student teaching, etc.) that *may take place outside the state of Nevada?*

- ☐ **Yes**
- ☒ **No.**

H. Institutional Review Process

i. Date of Faculty Review (may include additional information, as needed)

April, 2019: initial vote to move forward with the PhD program proposal
Fall, 2019: all semester, faculty were asked to provide feedback on both the pre-proposal and final proposal.

ii. Describe the process for review and approval by the appropriate academic policy body of the institution

We held a vote during our faculty meeting in April of 2019 in which a supermajority of faculty voted that we should move forward to create a PhD program.

I. Readiness to begin program

i. List the educational and professional qualifications of the faculty relative to their individual teaching assignments

As of July 2020, there will be 20 faculty in NRES, all of whom are actively engaged in cutting-edge research that is externally funded, generating high-impact journal publications and involving extensive numbers of graduate students. In general, the NRES faculty have research expertise in the following 10 areas:

1. Biogeochemistry and soil processes
2. Climate change impacts
3. Conservation biology
4. Ecohydrology
5. Environmental science
6. Fire ecology
7. Forest ecology and management
8. Landscape ecology
9. Restoration ecology
10. Wildlife ecology and management

ii. List the anticipated sources or plans to secure qualified faculty and staff

We currently have 17 research-active, tenure track faculty who are already available in the NRES Department to support the new PhD program. Additionally, adjunct NRES faculty from other UNR departments, the Desert Research Institute, and research scientists from federal resource management agencies with local offices (e.g. US Forest Service Rocky Mountain Research Station and the USDA Agricultural Research Services) will continue to be encouraged to mentor graduate students within the new PhD program, as they currently already do within our existing MS program. Administrative support will be provided by the existing staff of NRES as well as CABNR, and the CABNR administration has agreed to support all of its graduate programs, including this new, proposed one, with a single, dedicated administrative assistant who handles all administrative tasks associated with graduate students within the College.

iii. Contribution of new program to department's existing programs (both graduate and undergraduate) and contribution to existing programs throughout the college or university

The enhanced visibility and stature provided by the new PhD program to the Natural Resources and Environmental Science (NRES) department will provide a broad benefit to recruitment, retention and education at both undergraduate and graduate levels, and will further enable faculty research excellence by providing a PhD option for faculty whose disciplines are not well covered by existing graduate programs at UNR. More specifically, the NRES PhD program will provide options for graduates of the existing NRES MS program to pursue more advanced graduate work. It will also strongly complement the several undergraduate majors of the NRES department by providing additional opportunities for undergraduate involvement in graduate student-mentored research projects, and by increasing the pool of advanced graduate students available to serve as high-level teaching assistants for undergraduate courses. We further anticipated that the additional graduate students attracted to the new program will augment the enrollment of graduate courses currently offered through several departments and graduate programs other than NRES, allowing courses in these programs to better achieve critical mass. These might include other graduate programs that fall under the environmental "umbrella," such as Agriculture Veterinary and Rangeland Sciences (AVRS), Ecology Evolution and Conservation Biology (EECB), Environmental Sciences (ES), Geography, and Hydrologic Sciences (GPHS). We expect that the new NRES PhD students will also engage in an intellectual and scholarly way with students and faculty of these other graduate programs, leading to further development of interdisciplinary collaboration that spans across departments and colleges.

iv. Recommendations from prior program review and/or accreditation review teams

During our recent program review (2018) reviewers noted, "the small number of PhD students in comparison to the number of MS students is a clear deficiency of the overall strength of the graduate program." The reviewers went on to attribute this, in part, to a lack of a PhD that fully serves the diversity and goals of faculty in NRES. Furthermore, the NRES PhD program we have proposed fulfills other weaknesses identified by our program review in the graduate experience of NRES-advised students, namely the creation of a cohesive graduate student culture built by providing shared coursework that all graduate students are required to take and the creation of a seminar series. This would give all NRES graduate students greater opportunities for interaction, networking and collaboration.

J. Resource Analysis

i. Proposed source of funds (enrollment-generated state funds, reallocation of existing funds, grants, other state funds)

Enrollment will be directly tied to faculty research grants, with an expectation that 75% of graduate support comes from grants, with the remaining 25% coming from graduate teaching assistantships (GTAs). As such, the CABNR Dean has pledged to support the PhD program by committing to one GTA stipend annually for each four active NRES PhD students in the program, to a maximum of four GTA stipends per year. Additionally, CABNR has also agreed to provide a graduate director stipend and has agreed to provide an administrative assistant to support all graduate programs within the College, including this proposed program.

ii. Each new program approved must be reviewed for adequate full-time equivalent (FTE) to support the program in the fifth year. Indicate if enrollments represent 1) students formally admitted to the program, 2) declared majors in the program, or 3) course enrollments in the program.

a. (1) Full-time equivalent (FTE) enrollment in the Fall semester of the first, third, and fifth year.

1st Fall semester 4

3rd Fall semester 12

5th Fall semester 20

(2) Explain the methodology/assumptions used in determining projected FTE figures.

All graduate students participating in this program will expected to work full-time on their degree. Using the headcount estimates below (section J. ii. b.), a full-time credit expectation of 9 credits per term, and a required number of credits of 9 credits per term, the above numbers are calculated as:

Full-time equivalent (FTE) enrollment =
(Unduplicated headcount * required number of credits per term) /
(full-time credits expectation per term)

b. (1) Unduplicated headcount in the Fall semester of the first, third, and fifth year.

1st Fall semester 4

3rd Fall semester 12

5th Fall semester 20

(2) Explain the methodology/assumptions used in determining projected headcount figures.

Based on a comparable university (University of Illinois at Urbana-Champaign) with a well-established NRES PhD as well as an interdisciplinary Ecology, Evolution and Conservation Biology program, we believe we can achieve approximately 1 PhD student per faculty member in NRES by the end of the fifth year. We currently have approximately 16 research-active faculty, with ~ 1 new hire likely over the next several years, so we are projecting

approximately 17 new PhD students over 5 years, or approximately 4 new PhD students per year.

iii. Budget Projections – Complete and attach the Five-Year Program Cost Estimate and Resource Requirements Table.

See attachment.

K. Facilities and equipment required

i. Existing facilities: type of space required, number of assignable square feet, space utilization assumptions, special requirements, modifications, effect on present programs

No additional facilities are needed.

ii. Additional facilities required: number of assignable square feet, description of space required, special requirements, time sequence assumed for securing required space

No additional facilities are needed.

iii. Existing and additional equipment required
N/A

L. Describe the adequacy and availability of library and information resources
N/A

M. Student services

i. Describe the capacity of student support services to accommodate the program. Include a description of admissions, financial aid, advising, library, tutoring, and others specific to the program proposal

Individual students will be advised by their associated graduate advisors. No additional services will be required and the student body will not be affected.

ii. Describe the implications of the program for services to the rest of the student body
N/A

N. Consultant Reports – If a consultant was hired to assist in the development of the program, please complete subsections A through C. A copy of the consultant's final report must be on record at the requesting institution.

i. Names, qualifications and affiliations of consultant(s) used
N/A

ii. Consultant's summary comments and recommendations
N/A

iii. Summary of proposer's response to consultants
N/A

O. Articulation Agreements

i. Articulation agreements were successfully completed with the following NSHE institutions. (Attach copies of agreements)
N/A

ii. Articulation agreements have not yet been established with the following NSHE institutions. (Indicate status)
N/A

iii. Articulation agreements are not applicable for the following institutions. (Indicate reasons)
N/A

P. Summary Statement

The proposed Natural Resources and Environmental Science PhD program will provide our graduate students with a curriculum and training that has a more applied, natural resource-oriented focus than existing programs at UNR and NSHE, and that closely reflects the multidisciplinary nature of our department. An NRES PhD will provide a direct MS to PhD pipeline for students within our already successful MS program, as well as provide a pipeline for other NSHE institutions that provide undergraduate training in environmental sciences. Furthermore, by adding an NRES PhD program, our faculty will have improved capacity to recruit and retain graduate students whose interests do not fit well within the interdisciplinary programs that are available. Finally, a departmental PhD program will help to further raise the stature of NRES, which ranks among UNR's more active departments in terms of research productivity and graduate education.

NSHE Academic Program Proposal - Five-Year Program Cost Estimate and Resource Requirements

Enter N/A if the information is not applicable to the program proposal

Program Resource Requirements. Indicate all resources needed including the planned FTE enrollment, projected revenues, and estimated expenditures for the first, third and fifth fiscal years of the program. Include reallocation of existing personnel and resources and anticipated or requested new resources. Third and fifth year estimates should be in dollars adjusted for inflation. If the program is contract related, explain the fiscal sources and the year-to-year commitment from the contracting agency(ies) or party(ies). Note: This form reflects the NWCCU's Substantive Change Budget Worksheet as of 8/28/17.

College/University: _CABNR/UNR **Program: _NRES PhD**

I. PLANNED STUDENT ENROLLMENT

Note: Enrollment numbers (A + B) for each fiscal year should match the FTE/Headcount numbers in the Academic Program Proposal Form (Sect. I.ii.).

	FY 1: FY 21		FY 3: FY 23		FY 5: FY 25	
	FTE	Headcount	FTE	Headcount	FTE	Headcount
A. New enrollments to the Institution	4	4	12	12	20	20
B. Enrollments from Existing Programs	0	0	0	0	0	0

II. REVENUE

	FY 1: FY ____		FY 3: FY ____		FY 5: FY _____	
	On-going	One-time	On-going	One-time	On-going	One-time
1. New Appropriated Funding Request						
2. Institution Funds	$294,050		$589,663		$920,246	
3. Federal (e.g. grant, appropriation)						
4. New Tuition Revenues (registaration fee) from Increased Enrollments*						
5. Other Student Fees (associated with the program)*						
6. Other (i.e., Gifts)						
Total Revenue	$294,050	$0	$589,663	$0	$920,246	$0

Note: Total Revenue (Section I) should match Total Expenditures (Section III)

NSHE Academic Program Proposal - Five-Year Program Cost Estimate and Resource Requirements

Enter N/A if the information is not applicable to the program proposal

III. EXPENDITURES

	FY 1:	FY ____	FY 3:	FY ____	FY 5:	FY _____
	On-going	One-time	On-going	One-time	On-going	One-time
A. Personnel Costs						
1. FTE (**Total FTE for all personnel types**)	3.95	0	8.8	0	13.65	0
Faculty	1.7		2.55		3.4	
Adjunct Faculty						
Grad Assts	2		6		10	
Research Personnel						
Directors/Administrators						
Administrative Support Personnel	0.25		0.25		0.25	
Other: _____						
	Expenditures for personnel type below must reflect FTE levels in Section A.1.					
2. Faculty	$153,000		$243,477		$344,406	
3. Adjunct Faculty						
4. Graduate Assistants	$76,000		$241,885		$427,693	
5. Research Personnel						
6. Directors/Administrators	$3,000		$3,000		$3,000	
7. Administrative Support Personnel	$11,624		$12,657		$13,802	
8. Fringe Benefits	$50,426		$88,645		$131,346	
9. Other:						
Total Personnel Costs	$294,050	$0	$589,663	$0	$920,246	$0

NSHE Academic Program Proposal - Five-Year Program Cost Estimate and Resource Requirements

Enter N/A if the information is not applicable to the program proposal

	FY 1:	FY ____	FY 3:	FY ____	FY 5:	FY _____
	On-going	One-time	On-going	One-time	On-going	One-time
B. Operating Expenditures						
1. Travel						
2. Professional Services						
3. Other Services						
4. Communications						
5. Materials and Supplies						
6. Rentals						
7. Marketing materials and Advertising						
8. Miscellaneous						
Total Operating Expenditures	$0	$0	$0	$0	$0	$0

NSHE Academic Program Proposal - Five-Year Program Cost Estimate and Resource Requirements

Enter N/A if the information is not applicable to the program proposal

	FY 1: FY ____		FY 3: FY ____		FY 5: FY _____	
	On-going	One-time	On-going	One-time	On-going	One-time
C. Capital Outlay						
1. Library Resources						
2. Equipment						
Total Capital Outlay	$0	$0	$0	$0	$0	$0
TOTAL EXPENDITURES (IIIA + IIIB + IIIC):	$294,050	$0	$589,663	$0	$920,246	$0
Note: Total Expenditures (Section IIIA-C total) should match Total Revenue (Section I)						

Budget Notes:

1. As of Fall 2020, we expect 17 faculty to be associated with the PhD in NRES program. Faculty are expected to spend about 0.1 FTE teaching courses and advising graduate (PhD) dissertation work in Year 1, 0.15 FTE in Year 3 and 0.2 FTE in Year 5.

2. All salaries are expected to increase by 3% per year for COLA.

3. All Graduate Assistantships are considered at 0.5 FTE each. We estimate 4 (2 FTE) GAs in Year 1, 12 (6 FTE) in Year 3, and 20 (10 FTE) in Year 5. GA salaries include $19,000 stipend and tuition estimated at $4,458.75 per year (assuming 15 credits).

4. Benefits are calculated at 25.1% of salary for faculty and 12.7% of salary for GAs. Only salaries (stipend) are used to calculate fringe benefits for GAs.

5. Student travel for conferences and fieldwork will be supported by external grants from faculty advisors.

6. The Graduate Program Director (combined for NRES PhD and MS programs) will receive an annual stipend of $3000

7. A College-level administrative assistant will devote 0.25 FTE to the NRES graduate programs, including the proposed NRES PhD.