

Environmental Scan:
Graduate Certificate in Military Land Sustainability

North Carolina State University

Draft Report

Submission by:



Center for Research and Marketing Strategy

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I. Objective and Methodology

North Carolina State University (NC State) has requested the University Professional and Continuing Education Association (UPCEA) and its Center for Research and Marketing Strategy to provide information concerning the current market for a graduate certificate in military land sustainability. The University would like greater information on the potential market and its size, the competitive environment, and insight as to whether to develop as well as how to deliver the program.

The University Professional and Continuing Education Association and its Center for Research and Marketing Strategy conducted an environmental scan that includes a review of industry trends, occupational demographics and a competitive analysis. In addition to the secondary research, 12 opinion leaders from both the private sector and military representing a variety of organizations, including non-profit conservation organizations, civilian government agencies, the Army War College, as well as the U.S. Army, Air Force, and National Guard, participated in in-depth interviews.

II. Key Findings

- **Market and employment trends as well as limited direct competition, along with NC State’s established expertise and favorable location, should combine to most likely support a viable certificate offering in an admittedly niche specialty.** A key will be marketing to the right audiences and informing prospects about opportunities available in this niche field.
- **Many land management departments are becoming increasingly reliant on technology.** A range of applications including mobile tech, drones, remote sensing, GIS, and RFID will continue to exert growing influence over the coming years.
- **Social and policy trends emphasizing better and more comprehensive environmental stewardship are impacting the armed forces.** A move toward sustainable land management to protect productivity of land resources, increased government regulation on issues like endangered species protection, and sustainable development trends like renewable energy usage and LEED (Leadership in Energy and Environmental Design) certification all have implications for the military.
- **An occupational analysis found generally steady growth projections for the coming decade across a range of relevant job titles.** Nationally, environmental scientists and specialists currently have the highest total number of positions in a related field and are projected to retain that status through 2026. With the exception of environmental engineering technicians, all of the occupations profiled require a minimum of a bachelor’s degree for entry into the field.
- **In the land sustainability field, just as on the national level, environmental scientists and specialists have the highest number of jobs in 2016 in North Carolina and are projected to remain so through 2026.** Growth projections for several related professions overall tend to be more positive in North Carolina than nationwide.
- **Opinion leaders were generally positive about the program and its overall outlook.** They liked the idea of a convenient, affordable online graduate certificate program in this discipline that could be completed relatively quickly. Most participants expect that demand for this type of program will either increase or remain steady, although there was some disagreement over the market size and concern about a potentially narrow appeal.

- **Opinion leaders felt that the obvious and primary audience for this program would be civilian environmental consultants who partner with the military through non-profit organizations and defense contractors** (noted specifically for their access to financial resources to support attendance); however, participants also stressed the value of considering applications from active duty military personnel.
- **Climate change is perhaps the single most significant, pervasive issue affecting this field. The military is very focused on understanding the range of potential strategic and tactical implications of global climate change.** Other key concerns include the growing role of technology, working within budgetary constraints, and maintaining sustainable mission conditions in non-traditional combat conditions.
- **Communication is a key skill that should not be overlooked.** The discipline requires a deft touch for internal navigation of military politics as well as engagement with civilian stakeholders, such as adjoining private land owners and other government entities.
- **Overall, opinion leaders were very receptive to the curriculum content presented during the interviews.** Sustainable Military Land Management and Conflict Resolution for Natural Resource Managers elicited the most favorable reactions, while Wastewater Management drew the most mixed response. Commonly suggested additions were environmental law, climate change, ecosystem management, and military budgeting.
- **In discussing potential competition, opinion leaders frequently mentioned the Texas A&M offering, and the existing program seems to be strongly associated with its brand.** Colorado State's program was also well known through its Center for Environmental Management on Military Lands (CEMML). Beyond those two schools, opinion leaders were not able to suggest other directly comparable offerings in the marketplace.
- **While there are comparable bachelor's and certificate programs focused on sustainable development at institutions throughout the country, research identified only two direct competitors, including the program at Texas A&M.** The other, offered by Colorado State, will be discontinued. While the lack of competition bodes well for available market share, it also speaks to the limited appeal of this niche offering.

III. Recommendations

- **Consider conducting additional current and past student research** to further reduce risk and improve decision-making.
- **Strongly emphasize the NC State brand:** Research indicated a much higher profile for TAMU in the current arrangement, so NC State will want to aggressively distinguish its new, independent offering. Feedback from opinion leaders suggests that the University's brand equity will be a source of strength, and the local market in North Carolina, where the NC State name should carry additional weight, is very favorable in terms of occupational forecasts and regional military installations.
- **Focus on NGOs:** According to opinion leader input, non-profit conservation organizations that provide civilian consulting and support will be the primary source of prospective students for this program. NC State should focus recruiting efforts on NGOs with relevant missions. Concentrate on national organizations operating within North Carolina as well as relevant state-based groups and state agencies.
- **Consider marketing to defense contractors:** While the non-profit sector may claim the largest share of the applicant pool, the program should also apply to the private defense industry, especially given the increasing strategic importance of land management to mission sustainability. It was noted that these companies will have ready access to resources to assist employees with cost of attendance. NC State should explore options to partner with major contractors and to train environmental consultants or liaisons. Again, large corporations operating within the state and any small state/regional firms should be the primary focus.
- **Emphasize professional marketability:** The certificate offers a unique growth opportunity for those with relevant base knowledge/experience. While this is not the type of credential that enhances overall professional flexibility, it will ease entry into a subfield where qualified employees are scarce due to the need for specialized knowledge and a limited pool of qualified applicants. For those in search of a new challenge and/or seeking a secure position, it presents a chance to distinguish oneself and enter the hiring process with a major advantage.

- **Consider applications from active duty military:** While focusing on the civilian audience, opinion leaders stressed the value in also reaching out to military personnel. This training may be applicable for certain officer-level positions; one interviewee offered the Navy's Community Planning Liaison Officers as an example. Possibly position the certificate as a transitional credential, an option for expanding on military service to work in a related position after discharge.
- **Review content suggestions:** Research participants reacted favorably to the curriculum content presented, but also made some suggestions about additional topics of value (pp. 15-16). Technology and climate change, in particular, emerged as areas of emphasis. NC State should consider integrating these into the curriculum in some form. An alternative, given the limited scope of a certificate program, would be to offer a "current topics" seminar-type course that could potentially cover these or any other relevant emerging subjects. Additional insight could be gained by surveying current and past students on content and topic interests and needs.
- **Rely on targeted advertising:** Given the repeatedly-emphasized niche nature of the market, reaching the right audiences will be critical. Use targeted online advertising (e.g., Facebook, LinkedIn) and geotarget advertising (online and traditional) around military installations and Raleigh; reach out to trade associations (see below); circulate information among NC State alumni in related fields (e.g. biology, environmental science – cross-check against ROTC participation). Targeted online advertising should also help contribute to branding efforts designed to strengthen association with the NC State name.
- **Engage with the National Military Fish and Wildlife Association (NMFWA):** Several opinion leaders mentioned the prominence of the NMFWA within the professional community and stressed the potential value of working with this organization. Sponsorships are available. The group holds a training workshop at the annual North American Wildlife and Natural Resources Conference, in which NC State should have a presence, and could also circulate news about the offering among its membership. It was even suggested that the University might explore a partnership that somehow aligns its graduate certificate with the group's existing certification program.

IV. Trends in Military Land Sustainability Management

- **Growing Technological Needs** – Land management departments are seeing a growing complexity to their land units as more leases and data are added to their land systems. Along with this, the demanding development plans, land acquisition and sale operations, and changing reporting requirements present a challenge for many departments. Furthermore, land organizations are seeing fast attrition of seasoned professionals and a transition to the younger, less experienced workforce. All of these factors present a need for the use of advanced technology among land management departments. Many are turning to Geographic Information Systems (GIS) as a technological means of managing and troubleshooting increasingly complicated land systems. GIS allows for accurate land mapping in terms of boundaries, layering, and existing land figures and provides analytics for these land units. These systems are used both in the pre-acquisition phase as well as the development phase and drive efficiency by eliminating waste in all phases of management.¹
- **Debates in Federal Land Management** – There is an ongoing debate on the federal ownership of western land brought into the spotlight by the recent standoff at the Malheur National Wildlife Refuge in Oregon. Of the two main sides, one wants the federal ownership of land in the west to decrease and the other wants to maintain federal ownership of western land. The first side points to the “disastrous” land management by the federal government, identifying the dysfunction of politicians in Washington D.C. as the primary culprit.² In contrast, supporters of continued federal ownership cite the federal government’s crucial role in the preservation of this land,³ as well as the historical fact that many times over the past century and a half the federal government has put this land up for sale with no buyers.⁴

¹ <http://www.pwc.com/us/en/energy-mining/publications/assets/technology-trends-in-land-management-pwc.pdf>

² <http://www.nytimes.com/roomfordebate/2016/01/07/who-should-control-the-west/give-states-control-over-public-land-out-west>

³ <http://www.nytimes.com/roomfordebate/2016/01/07/who-should-control-the-west/federal-policies-protect-the-land>

⁴ <http://www.nytimes.com/roomfordebate/2016/01/07/who-should-control-the-west/neither-states-nor-settlers-wanted-ownership-of-much-of-the-land-out-west>

- **Sustainable Land Management (SLM)** – SLM aims to manage land in a way that meets our economic needs as a society while preserving the ecosystem. Sustainability and climate change are increasingly becoming concerns for the public and policymakers alike. Improper land management not only hurts the earth’s environment as a whole, but often also degrades the productivity and function of the land, raising economic concerns. A significant portion of the world’s previously productive land has been stripped of its functionality by improper management. Furthermore, the detrimental effects of global climate change and natural disasters on land resources are immense and unpredictable. Sustainable land management acknowledges these issues, and seeks to find the balance between production and preservation.⁵
- **Government protections – *The Endangered Species Act (ESA)*** – The ESA is designed to protect and recover imperiled species and the ecosystems on which they depend. The ESA was enacted in 1973 and is still upheld and administered by the U.S. Fish and Wildlife Service and Commerce Department’s National Marine Fisheries Service (NMFS). As a government agency, the military is required to protect these species in places where it trains soldiers, test weapons, and perform other essential functions.⁶ In 2013, the Army spent \$40 million on ESA compliance activities. Those actions were to protect endangered species and ensure the Army optimizes the conservation of its natural resources laid out in its plans.
- **Sustainable Design and Development Policy (SDD)** – The Sustainable Design and Development policy (SDD) is certified under the Leadership in Energy and Environmental Design (LEED) rating system. In the fiscal year 2013, there were 360 LEED certified projects, and some with multiple buildings. This policy requires facilities to comply with low-impact development and storm water management requirements. By the end of the fiscal 2013, 2% of the Army’s inventory was designated as high performance sustainable buildings. Through this process, the Army provides a means for sustainable development that supports mission requirements and responds to changing land constraints.⁷

⁵ http://siteresources.worldbank.org/INTARD/Resources/Sustainable_Land_Management_ebook.pdf

⁶ <http://www.asaie.army.mil/Public/ES/netzero/docs/FY%2014%20Sustainability%20Report.pdf>

⁷ <http://www.asaie.army.mil/Public/ES/netzero/docs/FY%2014%20Sustainability%20Report.pdf>

V. Opinion Leader Research

NC State Graduate Certificate

Needs and Trends: Opinion leaders commented on the knowledge and skills that are most needed in military land sustainability as well as current trends that are impacting the profession. Highlights from these conversations include:

- Although conservation agencies play an active and important role in helping to manage the natural resources on military property, the various branches themselves are taking a more active role in extending this function. Specialized training in this area will be applicable in both of these settings.
- Some opinion leaders noted specific demand within federal land management circles for greater specialized expertise in military applications, since these installations are managed differently than all other federal property.

“As you know, under Federal law the Department of Defense has to do good things for fish and wildlife species, and they do a lot of things very, very well, but natural resource management is really not within their wheelhouse. So there’s an ongoing need to manage natural resources, cultural resources, prescribed burns on military lands. And while the Sikes Act defers to natural resource agencies as kind of the first step, there’s lots of things that are kind of outside of our expertise level that we call upon academic institutions to help us with.”

- Program Director, conservation agency

“Our biggest mission is to ensure that the training mission can continue in the face of dwindling budgets, but also increased regulatory issues such as endangered species... We aren’t necessarily out there to save the environment; we’re there to ensure that the mission can continue all while having a good working ecosystem.”

- Natural Resources Program Manager, U.S. Fleet Forces

- Although there exists a ready supply of talent with a more generalized background in environmental science, biology, and fish and wildlife management, the pool shrinks considerably when seeking those who possess both this core knowledge and experience as well as great familiarity with the unique needs of the military.

- Knowledge and experience in this area can still have application in the civilian arena, particularly in terms of offering different perspective and alternative ways of approaching common environmental and land management issues.
- The military has become more conscious of the need to mitigate environmental impact resulting from combat operations. Managing the footprint of occupying forces and minimizing damage to environmental conditions and local ecosystems are legitimate considerations in strategic thinking.
- Environmental stewardship and responsible land management have also become integrated into the skills imparted to foreign allies by the military. Agriculture and water management come in alongside traditional skills of war during training operations.
- Budgetary constraints pose a persistent challenge that extends to the areas of land management and sustainability. Although these matters are a serious component of strategic considerations, they will always remain secondary to combat readiness issues. In this environment, specialists must be prepared to make the case for access to resources and be skilled at managing the resources allotted.
- An increasingly elaborate and complex regulatory structure also makes this work more challenging than ever before.

“Of course my expertise is wildlife biology, but in terms of just sustainable engineering, city planning and that sort of thing, I think that while those things do have problems that are unique to military bases they are kind of transferrable to civilian settings in many ways.”

- Fish & Wildlife Biologist, U.S. Air Force

“There’s a whole world of things out there related to military installations. They’re cities onto themselves, they have a lot of real estate actions that they participate in, they have a lot of energy decisions that they make including in-house development of energy resources or negotiating partnerships. It’s endless.”

- Ecological Division, Army Corps of Engineers

“I would say continue as is but a lot more technology based. Definitely the use of unmanned aerial vehicles, remote sensing information, pit tagging. A lot more technology based as opposed to the historical just putting a lot of people in the field.”

- Conservation Manager, Army National Guard

- Climate change is perhaps the single most significant, pervasive issue affecting this field. The military is very focused on understanding the range of potential strategic and tactical implications of global climate change and has devoted substantial internal resources to this task.
- Awareness and understanding of the technology-based applications for natural resource management is a valuable skill within this field. A range of tech concerns will continue to exert growing influence in the coming years (e.g., mobile tech, drones, remote sensing, GIS, RFID).
- Exploring greater integration of renewable energy sources into military operations is an area of increasing emphasis that will have an influence on this field going forward.
- Professionals serving in this capacity must have a strong grasp of the different land use requirements of a working military installation – training maneuvers, operating vehicles, test firing weapons, etc. – and plan to maximize the available resources to serve these needs while keeping within regulatory guidelines.
- A grasp of military politics

“Climate change adaptation is going to be a really big next step... everyone is getting hit in the face now with how will climate change affect these species, the management of the future, how will they create resilience to the effects of climate change so that they are not hampered even more with the reduction in species population biodiversity. How would they physically protect their installations? So how do they create resilience to sea level rise and storm surge? And the whole climate change, for them, goes beyond this. It goes into water supplies and agriculture and shortage of food and stability of nations and those kinds of things.”

- Associate Director-Government Relations, conservation organization

“I think there’s been a general movement to do less land training and more tech training. So, I think the old fence to fence garrisons and lands of the past are probably going to decrease in places where it’s not strategic to keep them. So, overall, I think there will probably be a reduction in the lands that the Army owns. But that’s a very slow process, as you might imagine. That doesn’t really change the complexity of the land management problem set that graduates would have to be involved in. So I think the skill sets are still needed even if the land does decrease in total volume or size.”

- Chief Environmental Quality, U.S. Army

and organizational culture is another crucial asset for professionals in this field. Understanding the political structure of the chain of command as well as a base environment and how to communicate and operate within them will contribute greatly to overall success.

- Military land management professionals must also be able to facilitate communication with property owners whose holdings border military installations, as in the establishment of compatible use buffers.
- With additional space for expanding base size and training grounds at a premium, maximizing value of the available land at military installations has become a priority. Good stewardship and land management practices are helpful in achieving this goal.
- The need for satellite training spaces (at home and abroad) to be used when existing properties are in use will present challenges in terms of identifying potential locations and safeguarding the local ecology; however, this can also open the door to improved stewardship in these areas as additional federal resources are brought to bear in maintaining them.

“The military is like a monarchy. The CO of your base is almost king and what he says goes. Often times it defies logic or science. I just think if I had come into the job understanding military culture, the hierarchy, and not having served in the military myself, it was a steep learning curve for me and all that.”

- Environmental Department, Naval Facilities Engineering Command

“I see large forest landowners that own adjacent properties being engaged by the DOD to ensure compatible activities in those surrounding places. And in an effort also, through the ACUB (Army Compatible Use Buffer) program, which is an easement program, and other programs, to try to prevent land use change around their fence borders which is going to inhibit their ability to operate. So, I think that the challenge of managing those lands inside the fence is increasingly complex and I see the DOD doing more and more proactively to try to deal with those issues. But it’s really an uphill climb, honestly, because I don’t think it’s going to get any easier.”

- Chief Conservation Officer, conservation organization

- Although the long-term trend may be toward some reductions in the total amount of land owned by the military, this will be a slow process, and the increasing complexity of managing the matrix of regulatory and stewardship concerns will ensure that the demand for specialized knowledge remains the same, or even increases slightly over time.
- It was noted that there are a limited number of bases and other installations worldwide where sustainable land management is a significant need, which could limit market size and viability for this program. One opinion leader estimated the number at roughly 100 facilities for the Army.
- The very controlled and regulated nature of military installations lends itself to advanced biodiversity management. Professionals with this expertise can help the armed forces optimize the potential of these facilities to contribute to improved environmental conditions nationally through species protection.

“What I’m saying is what I dealt with here at the War College when I worked in national security issues branch was, ‘OK, how can we leverage the environmental security at the strategic level when we, as the US, go in and do outreach?’ Instead of teaching a friendly foreign country about shooting people and breaking things, we also go in there and show them how to maximize crop yields and those kinds of things. How important water is.”

- *Professor, Army War College*

“I am not sure if I specifically see a high demand for a certificate in military land sustainability per se, but I do see a demand for creating compatible use buffers around and near lands such as military installations, wildlife refuges, and national parks and forests – these efforts have many similarities through which collaboration may glean many insights.”

- *Opinion Leader (title withheld)*

“As far as what can be done on the landscape, I think some of that is limited by will more than technological availabilities. Will and means. There are species issues that could be addressed and I think there is good science to inform what needs to be done but the money is just not made available to installations. You have to be very strategic in how they attempt to get funds to do the things they need to do that are not specifically targeted with a line item.”

- *Ecological Division, Army Corps of Engineers*

Concept Reactions: Participants gave their thoughts and suggestions regarding the NC State certificate program's market size, audience, and appeal. Key takeaways from these discussions include:

- Participants were generally positive about the program and its outlook. While there was some disagreement and uncertainty as to the size of the market, most opinion leaders agreed that additional academic training to serve this area would be valuable and welcome.
- Opinion leaders liked the idea of an online graduate certificate program for this discipline, because the format and delivery method would allow working professionals to earn the credential relatively quickly (and at a manageable cost) and begin applying their new knowledge and skills in the workplace.

"You have a good story and I think that you've got faculty there in multiple departments who have had great success working with the military, both from research things and I'm sure there are examples that are more private that I am unaware of. So I think you've got a great potential given the installations locally that you could tap into. Fort Bragg, Camp Lejeune and others."

- Ecological Division, Army Corps of Engineers

"It's one of those things that will catch on. The more that you create something like this and advertise it and give it credibility then I think yes."

- Associate Director-Government Relations, conservation organization

- The interview sample was split about evenly between those who expect demand for this type of program to grow in the future, those who believe it will remain steady without much increase, and some who were unsure.
- Factors like the political and regulatory environment, increased focus on the effects of climate change, and the value of focused certificate training that can be completed quickly and affordably were all mentioned as factors working in favor of demand growth.
- Conversely, opinion leaders who were hesitant about the program concept often cited skepticism that a certificate program could cover sufficient content to be genuinely impactful (versus a full degree) but admitted their lack of familiarity with similar credentials that are currently available.

- Base closings and the future of military land use in general represented the most common source of uncertainty about potential for increased demand.
- It will be important to identify where in the military authority structure most graduates of this program would be situated, as it will impact curriculum content and priorities.
- This credential would be helpful to a resume and to distinguishing an applicant during the hiring process. The certificate could be useful for those with a general environmental science or biology background who are seeking new professional opportunities and wish to make themselves more marketable within a niche field.
- Opinion leaders felt that the obvious and primary audience for this program would be civilian environmental consultants who partner with the military. It was noted that many NGOs perform these functions and could be a fertile recruiting ground; however, defense contractors will also have some involvement and possess ample resources to assist with cost of attendance.
- As noted elsewhere, participants also stressed the value of considering applications for active duty military personnel. Although the civilian audience may be larger and primary, the various branches have specific positions where this expertise could be useful (one interviewee offered the Navy's Community Planning Liaison Officers as an example).

"I would also like to say that I think that the military itself can benefit, particularly in the Navy. They created a position called the Community Planning Liaison Officers and they have almost required one of those positions at every installation across their Navy bases in the country. That person does this, period. When I started there were none of these people. They've created this position and these people are responsible for looking outside the fence line and, 'How do we sustain our mission?' So they work with the natural resources people, they work with the civil engineers, they work with the community planning departments, local governments and municipalities to ensure that somebody doesn't do something that is going to totally screw up their operations and mission."

- *Chief Environmental Quality, U.S. Army*

"Be broad in your curriculum approach because each branch of the military operates and views/values natural resources differently."

- *Opinion Leader (title withheld)*

- It was suggested that there are numerous management/oversight roles within the Department of Defense where this training could be applied, although participants were rarely able to drill down on details about these positions due to lack of familiarity. The Department of Energy was also considered a potential source of application.
- Opinion leaders were asked about which professions would benefit most from this type of optimized graduate certificate program. Their responses include:
 - Natural/cultural resource managers
 - Biologists (plant, wildlife, fishery, land)
 - Environmental scientists / Ecologists
 - Interdisciplinary natural scientists
 - Civilian contractors and non-profit consultants
 - City planners
 - Outdoor recreation specialists
 - State regulatory agents (e.g., military liaison)
 - Strategic and operational leadership
 - Civil affairs personnel
 - Community planning officers
 - Military land use planners

“It’s probably not decreasing but I don’t know about increasing a lot. It’s going to be tied to the number of bodies that need to use that knowledge and as the economy fluctuates from bad to worse or good to better we see the amount of project money changing for doing projects on the ground and in the field. But relatively small changes in the population of employees doing this kind of work.”

- *Environmental Department, Naval Facilities Engineering Command*

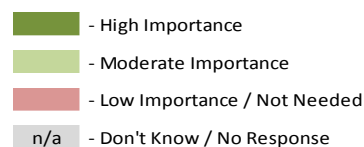
“I do think it’s a good idea and I think it’s needed. It would be nice to have a pool of candidates when we are hiring for these positions that have this background. Typically, it takes a while for somebody to be a trained biologist, be embedded into as a natural resource manager on an Air Force base and be able to be effective. I think having this kind of certificate and this training beforehand, I think they would be able to hit the ground running much, much more quickly than the way that we’ve been doing it.”

- *Program Director, conservation agency*

Program Content: Opinion leaders were asked for their opinions on the importance and relevance of nine potential topics associated with military land sustainability (11 of the 12 opinion leaders participated in this section of the research). Their responses are visualized below. The chart shows the degree of importance/need assigned to each topic as a curriculum component. The full list of topics presented during the interviews can be found above the chart.

- Sustainable military land management**
- Conflict resolution for natural resource managers**
- Field-based instruction with military installation site visits**
- Natural resources policy**
- Forestry management**
- Wastewater management**
- Threatened and endangered wildlife species and installations**
- Building working relationships and communicating for agreement**

| | Land Management | Conflict Resolution | Field-based Instruction | Natural Resources Policy | Forestry Management | Wastewater Management | Endangered Species | Building Relationships | Communications |
|---|-----------------|---------------------|-------------------------|--------------------------|---------------------|-----------------------|--------------------|------------------------|----------------|
| 1) - Professor, Army War College | High | n/a | High | High | High | Moderate | High | High | High |
| 2) - Associate Director-Government Relations, conservation organization | High | High | Moderate | Moderate | n/a | High | High | High | High |
| 3) - Program Director, conservation agency | High | High | High | High | Moderate | High | High | High | High |
| 4) - Natural Resources Program Manager, U.S. Fleet Forces | High | Moderate | High | Low | Low | High | Moderate | Moderate | High |
| 5) - Chief Environmental Quality, U.S. Army | High | High | Moderate | High | Moderate | High | High | High | Moderate |
| 6) - Fish & Wildlife Biologist, U.S. Air Force | High | High | Moderate | Moderate | High | High | High | High | Low |
| 7) - Environmental Department, Naval Facilities Engineering Command | High | High | Moderate | High | Low | High | High | Moderate | Moderate |
| 8) - Ecological Division, Army Corps of Engineers | High | High | Moderate | Moderate | Moderate | High | High | High | Low |
| 9) - Conservation Manager, Army National Guard | High | High | High | Moderate | Low | High | High | High | High |
| 10) - Opinion Leader (title withheld) | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| 11) - Chief Conservation Officer, conservation organization | High | High | High | Moderate | High | n/a | High | High | Moderate |
| 12) - Chief-Training and Simulations Division, U.S. Army | High | High | High | Moderate | n/a | High | Moderate | High | Low |



Communication with the media and public speaking

- Overall, opinion leaders were very receptive to the curriculum content presented during the interviews. Only two topics received lower importance ratings more times than being assigned the highest rating.
- As might be expected, Sustainable Military Land Management was recognized as the critical core component of certificate curriculum; it was the only topic considered to be of the highest importance by all 11 opinion leaders who participated in this portion of the research.
- Conflict Resolution for Natural Resource Managers was also considered to be a critical topic, garnering a High Importance ranking from all but one of the 11 participating opinion leaders, who still felt it was of Moderate Importance. Building Working Relationships and Communicating for Agreement also ranked among the most well-received topics (nine High Importance, two Moderate), and several participants suggested these two areas could be combined.
- Rounding out the most valued topics were Threatened and Endangered Wildlife Species and Installations, which also received nine rankings of High Importance and two more of Moderate Importance, as well as Natural Resource Policy (eight High, three Moderate). It was noted that the policy area is very broad and would need to be focused in order to have the greatest value for a certificate program.
- Wastewater Management was viewed as the least critical subject area for the majority of participants. Three assigned it the lowest importance rating and three more declined to offer a rating because of a lack of familiarity based on their job responsibilities.
- Communication with the Media and Public Speaking also drew mixed reactions, earning four High and four Moderate ratings to go along with three Low Importance rankings. In several cases, opinion leaders noted that people in these positions are permitted little to no contact with the press, so the public speaking component was viewed as more valuable than communicating with the media. It was again suggested that area could be folded into a broader, communications-focused course or topic area.

- Opinion leaders were asked to consider the most important educational topics and issues related to military land sustainability and suggest subject matter or course topics that could be included in the program content. Responses include:
 - Establishing and maintaining a suitable footprint for troops in the field
 - Water management
 - Climate change
 - Ecosystem management
 - Wildland fire management
 - Bird/wildlife aircraft strike hazard (BASH)
 - Managing human/wildlife conflict (e.g., BASH, pest management)
 - Safeguarding cultural resources
 - Working with government entities (other agencies, state and local government)
 - Proactive collaboration with adjoining property owners
 - Keeping up with environmental law and policy developments
 - Military budgeting
 - Understanding military hierarchy and culture

- The most commonly cited item was a focus on environmental law/policy. Other popular topics were climate change, ecosystem management, and a primer on military economics/budgeting.

“If you take a look at past conflicts, we’ve been able to, along with allies, been able to sustain our troops in the field because we had so much supply logistics, and so on and so forth. And I’m not sure that we’re going to be able to or have to do that anymore. So being able to support, for whatever time period that our troops are in the field, is going to be an issue. All the water they need and those kinds of things.”

- *Professor, Army War College*

“This is kind of nebulous, but definitely trying to integrate natural resources management with the everyday structure and function of a working military base. Because bases have some of the biggest ranges and they manage for more T&E (threatened and endangered) species than any other land owner in the United States, trying to integrate that with just the everyday goings on of a base.”

- *Fish & Wildlife Biologist, U.S. Air Force*

Perceived Competition: Interviewees were asked about colleges, universities or programs that came to mind when discussing military land sustainability programs. Key learnings from this section of the interviews include:

- The existing program appears to be strongly associated with the Texas A&M brand. It was named much more frequently than NC State in reference to the current offering.
- Opinion leaders were very aware of the two comparable programs that also came up through competitive scanning – Colorado State and Texas A&M. CSU was particularly well known for its Center for Environmental Management on Military Lands (CEMML). Half of the participants mentioned it, although none referenced the pending reductions to the program.
- Beyond those two schools, opinion leaders were not able to suggest other directly comparable offerings in the marketplace. It was noted that this niche specialty is served by very few providers. One opinion leader believed that George Mason University might have a somewhat similar program, but a review of the school’s sustainability program did not identify one.
- Other schools that were noted, based on opinion leaders’ experience, as having extensive and favorable working relationships with the military were College of William and Mary, NC State, Penn State University, University of Oklahoma, University of Wyoming.
- It was noted that the National Military Fish and Wildlife Association offers an informal certification in military land management and even suggested that NC State might find some alignment with this program.

“Actually The Center for Environmental Management on Military Lands, CEMML, is housed out of the Horner College of Excellence at Colorado State University (CSU). So we work with them a lot. CEMML does a lot of our non-traditional programs through CSU. For example, a project that no one else would touch, is looking at assessment of vulnerability for law enforcement. That’s not something that you could throw to just anybody but CEMML was willing to take on that project which is pretty unique.”

- Program Director, conservation agency

VI. Occupational Analysis

The occupations highlighted in this section have been selected because of the potential interest professionals in these fields could have in the NC State certificate program. The list of occupations detailed below is not exhaustive, but rather it is believed to be a representative sample of professionals who could have interest in the program.

Of the selected occupations, environmental scientists and specialists currently have the highest total number of jobs nationwide in 2016 and are projected to retain that status through 2026. With the exception of forest and conservation technicians and environmental engineering technicians, all of the occupations profiled require a minimum of a bachelor's degree for entry into the field.

Table 1: Top National Occupations with Potential Interest⁸

| Occupation | Jobs | | Change | | Annual Salary | Entry level Education |
|--|--------|---------|--------|-----|---------------|-----------------------|
| | 2016 | 2026 | # | % | | |
| Environmental Scientists and Specialists, Including Health | 94,933 | 108,662 | 13,729 | 14% | \$68,027 | Bachelor's degree |
| Biological Technicians | 76,045 | 83,460 | 7,415 | 10% | \$42,613 | Bachelor's degree |
| Environmental Engineers | 56,115 | 65,463 | 9,348 | 17% | \$83,668 | Bachelor's degree |
| Natural Sciences Managers | 55,870 | 60,262 | 4,392 | 8% | \$126,508 | Bachelor's degree |
| Geoscientists, Except Hydrologists and Geographers | 35,464 | 41,344 | 5,880 | 17% | \$97,414 | Bachelor's degree |
| Biological Scientists, All Other | 34,623 | 36,062 | 1,439 | 4% | \$75,446 | Bachelor's degree |
| Forest and Conservation Technicians | 32,546 | 32,349 | -197 | -1% | \$35,067 | Associate's degree |
| Landscape Architects | 24,284 | 25,673 | 1,389 | 6% | \$61,053 | Bachelor's degree |
| Conservation Scientists | 21,186 | 22,953 | 1,767 | 8% | \$62,488 | Bachelor's degree |
| Zoologists and Wildlife Biologists | 20,217 | 21,684 | 1,467 | 7% | \$59,651 | Bachelor's degree |
| Environmental Engineering Technicians | 18,547 | 21,543 | 2,996 | 16% | \$49,535 | Associate's degree |
| Soil and Plant Scientists | 16,879 | 18,693 | 1,814 | 11% | \$59,734 | Bachelor's degree |
| Foresters | 10,083 | 10,883 | 800 | 8% | \$59,299 | Bachelor's degree |
| Fish and Game Wardens | 6,386 | 6,607 | 221 | 3% | \$53,070 | Bachelor's degree |

⁸ Data from EMSI 2016.2

Just as on the national level, environmental scientists and specialists have the highest number of jobs in 2016 in North Carolina and are projected to remain so through 2026. Natural sciences managers overwhelmingly have the highest salary, more than double most of the other occupations highlighted.

Table 2: Top North Carolina Occupations with Potential Interest

| Occupation | Jobs | | Change | | Annual Salary | Entry level Education |
|--|-------|-------|--------|-----|---------------|-----------------------|
| | 2016 | 2026 | # | % | | |
| Environmental Scientists and Specialists, Including Health | 4,243 | 4,807 | 564 | 13% | \$55,146 | Bachelor's degree |
| Natural Sciences Managers | 2,343 | 2,607 | 264 | 11% | \$130,902 | Bachelor's degree |
| Biological Technicians | 1,747 | 2,071 | 324 | 19% | \$40,010 | Bachelor's degree |
| Environmental Engineers | 1,435 | 1,726 | 291 | 20% | \$74,245 | Bachelor's degree |
| Soil and Plant Scientists | 991 | 1,090 | 99 | 10% | \$58,371 | Bachelor's degree |
| Biological Scientists, All Other | 852 | 951 | 99 | 12% | \$71,407 | Bachelor's degree |
| Geoscientists, Except Hydrologists and Geographers | 717 | 846 | 129 | 18% | \$66,322 | Bachelor's degree |
| Landscape Architects | 618 | 677 | 59 | 10% | \$59,339 | Bachelor's degree |
| Forest and Conservation Technicians | 524 | 543 | 19 | 4% | \$37,693 | Associate's degree |
| Conservation Scientists | 470 | 523 | 53 | 11% | \$57,884 | Bachelor's degree |
| Zoologists and Wildlife Biologists | 426 | 478 | 52 | 12% | \$50,079 | Bachelor's degree |
| Environmental Engineering Technicians | 420 | 519 | 99 | 24% | \$46,010 | Associate's degree |
| Foresters | 355 | 388 | 33 | 9% | \$57,922 | Bachelor's degree |
| Fish and Game Wardens | 283 | 293 | 10 | 4% | \$37,388 | Bachelor's degree |

VII. Competitive Analysis

NC State’s graduate certificate in military land sustainability is an extremely specialized program. Only two programs in the country were found to have the same level of specific focus: Texas A&M and Colorado State University. The program at Colorado State is expected to retire in the coming years according to the university’s website.

Table 3: Specific Programs in Military Land Sustainability

| Institution | Program | Credits | Delivery | Tuition | |
|--|--|---------|----------|----------|--------------|
| | | | | In-State | Out-of-State |
| Colorado State University ⁹ | Certificate of Completion in Sustainable Military Lands Management | 9 | Online | \$2,396 | |
| Texas A&M | Graduate Certificate in Military Land Sustainability | 14 | Online | \$3,268 | \$8,826.00 |

Though not as specific as the NC State program, there are other similar sustainable land management programs offered nationwide. For reference purposes, this competitive profile contains a representative cross-section of comparable undergraduate and graduate certificate programs as well as one undergraduate program from across the country, most of which are offered online.

Table 4: Similar Programs to Military Land Sustainability

| Institution | Program | Credits | Delivery | Tuition | |
|------------------------------|--|-----------|----------------------|----------|--------------|
| | | | | In-State | Out-of-State |
| Harvard University | Graduate Certificate in Natural Resource Management and Sustainable Ecosystems Certificate | 4 Courses | On Campus and Online | \$10,200 | |
| University of Wyoming | B.A. in Professional Land Management Concentration | 128 | On Campus | \$15,872 | \$63,488 |
| University of Florida | Graduate Certificate in Sustainable Land Resource and Nutrient Management | 12 | Online | \$6,780 | |
| University of Connecticut | Graduate Certificate in Sustainable Environmental Planning and Management | 12 | Online | \$5,262 | \$16,033 |
| American Public University | Undergraduate Certificate in Public Lands Management Certificate | 18 | Online | \$4,860 | |
| | Graduate Certificate in Environmental Sustainability | 18 | Online | \$6,300 | |
| University of Southern Maine | Graduate Certificate in Sustainable Development | 12 | On Campus | \$4,560 | \$12,312 |

⁹ Program is being retired, clarification included in program summary

*Competitive Program Analysis*¹⁰

Direct Competition

Colorado State University – Certificate of Completion in Sustainable Military Lands

Management – This program will enhance the certificate holder’s knowledge of military land management and understanding of cultural and ecological significance. The program is only partially retiring as a certificate issued by CSU Online. The courses required for this certification are still being offered and will appear on a transcript but the certificate will not be. The program exists but the certificate is yet to be recognized on the University level.

Texas A&M – Graduate Certificate in Military Land Sustainability – This is a web based program that educates students on the relationships between ecology, economics, policy and culture that influence military lands. It is comprised of three integrated areas of land management, policy analysis and development, and cultural competencies and conflict management.

Similar Competition

Harvard University – Graduate Certificate in Natural Resource Management and Sustainable Ecosystems – This program isn’t designed to accommodate military application but it shares many of the shared goals of the original NC State program. Commonalities include education in fisheries, wildlife management, and environmental analysis. This certificate requires four courses, two in natural resource management knowledge, and two in natural resource management science. There are over twenty courses from which to choose to complete the certificate.

University of Wyoming – B.A. in Professional Land Management Concentration –This program is accredited by the American Association of Professional Landmen. This degree doesn’t directly involve military contracts but still could be of use due to its education involving energy, geology, and regulatory policy. Those facets of this degree are in alignment of the goals of the original programs emphasis on ecosystems and environmental resources.

University of Florida – Graduate Certificate in Sustainable Land Resource and Nutrient Management – This degree isn’t intended for military application, but shares common themes with the original program from NC State such as environmental soil, water and land use; sustainable agricultural; and urban land management. The skills developed through this program also have similar applications in sustainable agroecosystems, wetland and water resource management. This program’s electives include environmental nutrient management, environmental soil physics, and environmental pedology. A defining feature of this certification

¹⁰ All information gathered is from each institution’s respective website

is its degree requirements for a bachelor's in soil and water sciences or in geology, natural sciences, biology, ecology, hydrology, microbiology, environmental science, horticultural science, environmental engineering, agricultural engineering or agronomy.

University of Connecticut – Graduate Certificate in Sustainable Environmental Planning and Management – This program teaches students to identify the operations and changes to an ecosystem, apply geospatial skills in a planning context, analyze environmental management plans, prepare environmental plans, and evaluate environmental management plans for sustainable outcomes. The in-depth knowledge of environmental management plans is similar to that of ecosystems sciences and environmental resources with which the NC State program is developed. The similarities between the program's environmental studies is important enough to warrant its program as part of the competitive analysis.

American Public University – Undergraduate Certificate in Public Lands Management – This certificate explores origins of national parks, forests, and refuges and studies the tools and techniques used by land managers to provide services to the public. Defining educational features of this program include course topics in fish and wildlife studies, public land management, strategies and laws, and land use planning methods and techniques. That information can be applied in similar aspects to that of the original NC State program.

Graduate Certificate in Environmental Sustainability – This certificate focuses on several topics such as sustainability, policies, economics, and global resource allocation. The curriculum requires course topics that involve environmental economics; environmental policies, regulations, and laws; energy policy; sustainability; and decision making. The information from these topics is similar to those topics discussed in NC State's program that requires environmental resource knowledge, and ecosystem sciences.

University of Southern Maine – Graduate Certificate in Sustainable Development – This program gives individuals a firm understanding of land use, environmental planning, economic development, and planning for regional and community sustainability. Courses include sustainable development, environmental law and policy, and global planning issues. Those courses and their application can be easily integrated into land management.