

Accredited Undergraduate Environmental Engineering Education at PUIs

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Abstract

Background: PUIs (Primarily Undergraduate Institutions) are recognized for programs focused on undergraduate student success via high contact between faculty and students without the competing interests of graduate students and large technical research programs. While this may alter the publicity of such programs, the curricular content standards must be maintained for accreditation via ABET.

Purpose and Methods: This descriptive study aims to document the development and spread of ABET Accredited Environmental Engineering programs in the US with a focus on PUI programs. Such information would be of use for future students and faculty who wish to learn/work in such a program. Additionally, this analysis is useful for programs identifying peer institutions for other forms of analysis.

Results: As of Fall 2022, ABET recognized 83 baccalaureate Environmental Engineering programs and 261 Civil Engineering programs in the United States. Of these, eight Environmental Engineering programs and 45 Civil Engineering programs are taught at PUIs. Trends in institution type and location are presented. Further analysis presents the degree to which students can specialize, formally or informally, in environmental engineering topics within an accredited Civil Engineering Major.

Keywords

Environmental Engineering, Civil Engineering, ABET, PUI, Undergraduate Education

1. Introduction

Environmental Engineering (EnvE) is a relatively new and continuously evolving interdisciplinary form of engineering. EnvE is at the intersection of civil engineering, chemical engineering, chemistry, biology, and more. Many institutions of higher education do not offer a dedicated undergraduate degree in EnvE, instead students complete a different undergraduate degree and then specialize via a graduate-level EnvE program. Given the high level of specialization traditionally done at the graduate level, formation of EnvE undergraduate programs is a recent phenomenon in the US. Further complicating the expansion of EnvE programs in the US is the high number of undergraduate-dominant institutions (also known as primarily undergraduate institutions – PUIs) that do not host their own graduate program for continued graduate-level study. PUIs may have limitations on faculty expertise to teach across the breadth of EnvE related topics due to the limited research capacity of the institution. This paper aims to document the distribution of EnvE programs at PUIs and adjacent programs (i.e.

Civil Engineering) that may pose an alternative path into EnvE practice for undergraduates. Further, preliminary curricular comparison among EnvE PUI programs is presented to provide a record of current potential gaps in EnvE as taught at PUIs which lack graduate programs to supplement specialization and provide additional technical research opportunities on campus for students and faculty.

2. Background

2.1 Primarily Undergraduate Institutions

Primarily Undergraduate Institutions (PUIs) are a special category for grant consideration under the NSF. These are defined as institutions that grant baccalaureate degrees in NSF supported fields, that have a greater undergraduate enrollment than graduate enrollment, and that award fewer than 10 doctoral degrees per year in the NSF supported disciplines. One 2013 publication determined there were 2104 PUIs (of which 875 were 2-year institutions) via a cross reference of the Carnegie Classification and the NSF Program Databases [1]. Further, this study tabulates NSF Awards from the BIO Directorate between 2002 and 2012. It was found that PUIs received 8% of the awards during this period and 4.9% of the award amount in dollars. This accords with one of the most common publication topics related to PUIs – challenges and best practices for research at PUIs [2], [3]. The other major topic of academic publication related to PUIs is faculty advice- how to get a job at a PUI and/or achieve tenure [4]–[7]. The term “PUI” is not widely used in popular media among current and prospective students. Instead the classifications of “college” versus “university” may be applied to distinguish, though possibly inaccurately, between non-doctoral and doctoral institutions [8]. Also, the term “liberal arts college” may be used to describe an undergraduate-predominant institution, however, again, the use of “liberal arts” is not accurate in all cases, especially for science and technology focused institutions [9]. For example, Rose-Hulman Institute of Technology does not offer doctoral degrees and awards more baccalaureate degrees than Master’s (thus meeting the definition of PUI per NSF) but is not a liberal arts school. The most accurate approximation of PUI in popular media may be found via the US News & World Report “Best Undergraduate Teaching” List and discipline specific lists such as “Engineering (Doctorate Not Offered)” [10]. These institutions are known to prioritize undergraduate education over research output, and often boast small class sizes and high faculty-student interaction at the undergraduate level.

2.2 Environmental Engineering Education

Environmental engineering (EnvE) can be defined as the branch of engineering responsible for protection of humans from adverse environmental effects and protection of the environment from adverse anthropogenic effects [11]. In practice, this includes many activities (or subdisciplines) including pollution prevention, remediation, and environmental restoration in the media of air, water, and soil. The modern governing body, American Academy of Environmental Engineers and Scientists (AAEES), was established in 1955 to improve training and review of sanitary engineers but has been expanded overtime to include additional subdisciplines within EnvE [12].

Early EnvE college programs were seen in the 1800s in the US but were often called “sanitary engineering” programs or were simply just a subdiscipline in another department [13]. EnvE has struggled to form a unique identity from the disciplines it evolved from [14]. Historically, EnvE topics were taught as a part of other disciplines of engineering, such as civil or chemical engineering, or applied sciences, such as forestry. Even into the 1970s after some EnvE programs were founded, leaders in environmental engineering questioned if it was possible to develop an undergraduate curriculum to prepare workforce ready graduates because much of the field requires specialized understanding acquired through a graduate degree [15]. As shown in a Civil Engineering (CivE) curriculum review in the mid-2000s, environmental engineering is often a “specialty area” within civil engineering, similar to structural engineering or transportation engineering, rather than as a unique discipline [16]. The 2009 *Body of Knowledge (BOK) for Environmental Engineering* acknowledges that most practicing environmental engineers acquire the necessary knowledge through completion of graduate studies, however the growing need for trained environmental engineers also led to the creation of undergraduate curricula [11], [17]. The format of the BOK was modeled on the Body of Knowledge generated by the American Society of Civil Engineers (ASCE) for CivE. The EnvE BOK centers around 18 Outcomes in three categories: Foundational, Enabling Knowledge and Skill, and Professional. AAEES and the BOK for EnvE assist in the evaluation and accreditation of EnvE programs in the US.

2.3 ABET Accreditation

The Accreditation Board for Engineering and Technology (ABET) is the major accreditation body for engineering in the US and 39 other countries around the world. ABET sets standard expectations for college-level content in engineering and technology fields through consultation with the discipline’s professional society (e.g. AAEES for EnvE and ASCE for CivE) and supervision of the Engineering Accreditation Commission (EAC) [18]. In addition to specific areas of technical knowledge, ABET includes some professional-readiness skills such as teamwork, communication, and data analysis [19]–[21]. Accreditation in its modern form does not consist of a check list of requirements which could create high levels of curricular uniformity across institutions. The old check list format led, in part, to the development of the modern EC2000 standards [22]. Modern accreditation requires that the program collects and analyzes data related to student performance during and after the program to make certain that the program is continuously improving while ensuring they continue to cover the technical skills outlined in the relevant BOK [23]–[26]. It should be noted that ABET is commonly used by state licensing boards to verify that potential licensed professional engineers completed their education at a quality institution. However, ABET accreditation is a volunteer-based process and thus some programs may choose to let their accreditation lapse or never become accredited at all [18], [27]. For the purposes of this study, EnvE programs reported are limited to those with ABET accreditation due to the tie to professional practice. Non-accredited EnvE programs may exist at PUIs outside of those listed. Further, this paper excludes institutions accredited as “General Engineering” programs. While a General Engineering program may offer a concentration in EnvE or EnvE-related elective courses, the depth and breadth of EnvE curricular content is less standardized by ABET and EnvE professional societies. Students graduating from

Chemical Engineering or Mechanical Engineering program may enter the workforce in EnvE jobs, however, such baccalaureate curricula less likely to contain specific EnvE courses, unlike CivE, and thus is also excluded from this study.

3. Research Purpose and Questions

This study was designed to record the expansion of ABET accredited Environmental Engineering programs in the US within undergraduate institutions. As previously noted, programs included for analysis include ABET accredited EnvE and CivE programs while excluding others that may incidentally place students in EnvE careers such as General Engineering, Mechanical Engineering, or Chemical Engineering. The record presented here can be used by academic intuitions to identify peer programs for individual program benchmarking efforts. Further, prospective faculty may find such a list illuminating as much publicity is given to research-focused faculty positions in engineering graduate schools while less uniform data is available for teaching-focused faculty options. Finally, students who wish to pursue environmental engineering at a PUI due to the undergraduate student focus may use the information to identify such programs.

The research questions addressed in this paper include:

- (1) How many accredited PUI programs exist for environmental engineering education in the US and what is the distribution of such programs?
- (2) Can a student at a PUI accredited for civil engineering customize his or her program to focus on environmental engineering?
- (3) What breadth of EnvE coursework is offered at PUI programs?

4. Methods

4.1 Program List Compilation

The two primary data sources used to compile the data presented here are (1) 2021 Carnegie Classifications Public Data File and (2) ABET Accredited Programs Listing from the ABET website [28], [29]. The Carnegie data set classified schools based on enrollment, location, and research output among other parameters. The 2021 data set was initially compiled in winter 2021 and was published in 2022 after public review and corrections. The ABET data set included all institutions that have active accreditation for a bachelor's degree of engineering in Environmental Engineering or Civil Engineering specialty areas. Institution name and locations were used to cross reference programs on the ABET list to the additional data provided by the Carnegie list.

4.2 Program Classification and Analysis

The cross-referenced lists identified all ABET accredited CivE and EnvE programs which were then parsed to identify schools that do or not confer doctoral degrees. This division was used to

identify PUIs, though it is not a direct application of the NSF PUI definition [30]. It is a simplified version of the institution classification scheme used by Slocum and Scholl [1]. Additional quantification by location and institutional specialization was performed.

4.3 Curricular Investigations

Utilizing publicly available course plans and course catalogs at the previously identified institutions, the degree to which a student in a CivE program could specialize in EnvE topics was analyzed. Additionally, a curricular comparison between accredited EnvE PUIs was compiled.

5. Results and Discussion

5.1 Frequency of EnvE PUI Programs and ABET Accreditation

Out of the 83 ABET accredited EnvE programs in the US, 75 are located within doctoral-degree granting institutions and eight (8) are located in non-doctoral granting institutions (Appendix A). While some of the 75 Ph.D. granting institutions may have EnvE programs that do not grant doctoral degrees, the classification of PUI applied here is at the institution level rather than by program. The eight EnvE PUI programs are:

1. Bucknell University
2. California Polytechnic State University-San Luis Obispo (Cal Poly Obispo)
3. California State Polytechnic University-Humboldt (Cal poly Humboldt)
4. Central State University
5. Saint Francis University
6. United States Military Academy (West Point)
7. Universidad Politecnica de Puerto Rico (PUPR)
8. University of Wisconsin-Platteville.

Among these, three - Bucknell, Central State, and West Point – are classified as “Baccalaureate Colleges” via the Carnegie Classification system. The other five are classified as “Master’s Colleges & Universities.” By definition, Baccalaureate Colleges are institutions where 4-year undergraduate degrees represent at least 50% of all degrees awarded and fewer than 50 master’s or 20 doctoral degrees are awarded per year. A “Master’s College” is an institution that awards at least 50 master’s degrees but fewer than 20 doctoral degrees per year. As the Master’s College classification is not based on the relative amounts of Master’s degrees to bachelor’s degrees. An institution that awards more than 50% of the total degrees per year as bachelor’s while awarding at least 50 master’s degrees and no doctoral degrees would still be classified as a Master’s College. However, this institution may align the mainly teaching-oriented mission of a PUI and thus are presented here as PUIs.

Due to the historic links between EnvE and the CivE field, CivE programs are also included for analysis. Out of the total 261 ABET accredited CivE programs, 45 are at non-doctoral granting institutions while 216 are in doctoral granting institutions (Appendix B). Among the non-doctoral granting CivE programs, 24 are in “Master’s Colleges & Universities” and 15 are at

“Baccalaureate Colleges”. Further, one institution (Rose-Hulman Institute of Technology) receives special classification in the Carnegie system as a “Special Focus Four-Year” specializing in engineering and technology. The remaining five institutions, while not granting doctoral degrees are classified as “Doctoral/Professional Universities” indicating that the overall institution awarded at least 30 professional practice doctoral degrees and may have also awarded at least 20 research/scholarship doctoral degrees. These five institutions are Bradley University, Quinnipiac University, Seattle University, Valparaiso University, and Western Kentucky University. All of these institutions offer professional doctoral programs (Juris Doctor, Doctor of Nursing, Doctorate in Education, etc.), but none have research/scholarship doctoral degrees according to the college course catalogs.

In summary, just under 10% of accredited EnvE programs are at non-doctoral institutions compared to 17% of CivE programs are. Among all 4-year institutions in the Carnegie database, nearly 73% of institutions do not grant doctoral degrees (1685 of 2322 institutions). While it may seem that accredited engineering programs are vastly underrepresented at PUIs, one must consider the financial liability of investing in engineering programs relative to potential student enrollment. Most small colleges are unable to support engineering programs due to their small student bodies and lack of financial ability to hire engineering faculty who on average require higher salaries than those in humanities or social sciences. Further, engineering is often considered a specialty program and many states restrict colocation of state-supported specialty programs due to limited funding. Engineering and science doctoral programs are heavily research oriented and there is an unspoken expectation that PhD graduates will continue to pursue high-level technical research after graduation, creating a research institution faculty pipeline. Further, there is significant overlap of EnvE and CivE accreditation in PUIs. This may be in part due to the historic growth of EnvE departments from existing CivE programs, or the proven financial capacity of the institution to support engineering. Only Cal Poly Humboldt, Central State, and Saint Francis have an accredited EnvE program without also having a CivE program. The other five PUIs host both accredited EnvE and CivE programs.

Institutional specializations - including land-grant institutions, historically black college or university (HBCU), and Hispanic serving institutions (HSI) - are all represented among the EnvE PUI programs. Central State is a land-grant institution and an HBCU. Cal Poly Humboldt and PUPR have HSI classifications. While there are 16 institutions in the Carnegie data set that are classified as “Tribal Colleges” none offer either an EnvE or CivE accredited degree program. Further, West Point received special classification as a US Military Service (MLTY) School.

5.2 Spatial and Temporal distribution of EnvE and CivE Programs

ABET was originally founded in 1932 under the name Engineers’ Council for Professional Development before changing the name to Accreditation Board for Engineering and Technology (ABET) in 1980. The first year of official program evaluation (accreditation) was 1936. CivE topics were among the earliest of engineering college programs developed and thus 86 CivE programs (including 7 of the 45 CivE PUIs) were accredited at this earliest possible date (Figure 1). Since then, on average two additional CivE programs have been accredited per year. CivE PUIs are accredited at a rate slightly under one every two years.

EnvE is regarded as a newer engineering discipline that grew out of CivE and fundamental science disciplines. The first college programs, documented in the early 1800s, were at Rensselaer Polytechnic Institute, Norwich University, Union College, and West Point [13]. ABET accreditation of EnvE programs began in 1966 when Rensselaer was accredited (Figure 1). Additional accreditations progressed at a rate of approximately one every three years until 1990, after which an average of 2.5 accreditations were added per year. Two of the EnvE PUIs were accredited prior to 1990 – Cal Poly Obispo (1971) and Cal Poly Humboldt (1981) – while the remaining six were accredited after, reflecting the overall increased accreditation rate. Bucknell and Central State received accreditation most recently in 2017.

One may assume from the history of the disciplines that institutions with both EnvE and CivE programs had the CivE program first. This is correct for four of the five EnvE/CivE PUIs – Bucknell, West Point, PUPR, and UW-Platteville. Bucknell has the longest period of time between program accreditations- the CivE program was accredited at the earliest possible date (1936) while the EnvE program was one of the most recently accredited, in 2017. The only exception among the dual accredited PUIs is Cal Poly Obispo. The EnvE program was accredited in 1971, two years before the CivE program. However, this accords with school-specific history where the CivE degree, and the larger Civil and Environmental Engineering Department, grew from a merger of the former Transportation Engineering and Environmental Engineering departments. Such school-specific history can also inform the evolution of EnvE-only PUIs. For example, Cal Poly Humboldt’s EnvE program is taught from the College of Natural Resources & Sciences alongside majors in Forestry and Wildlife management. To date, it is the only engineering discipline offered by the institution.

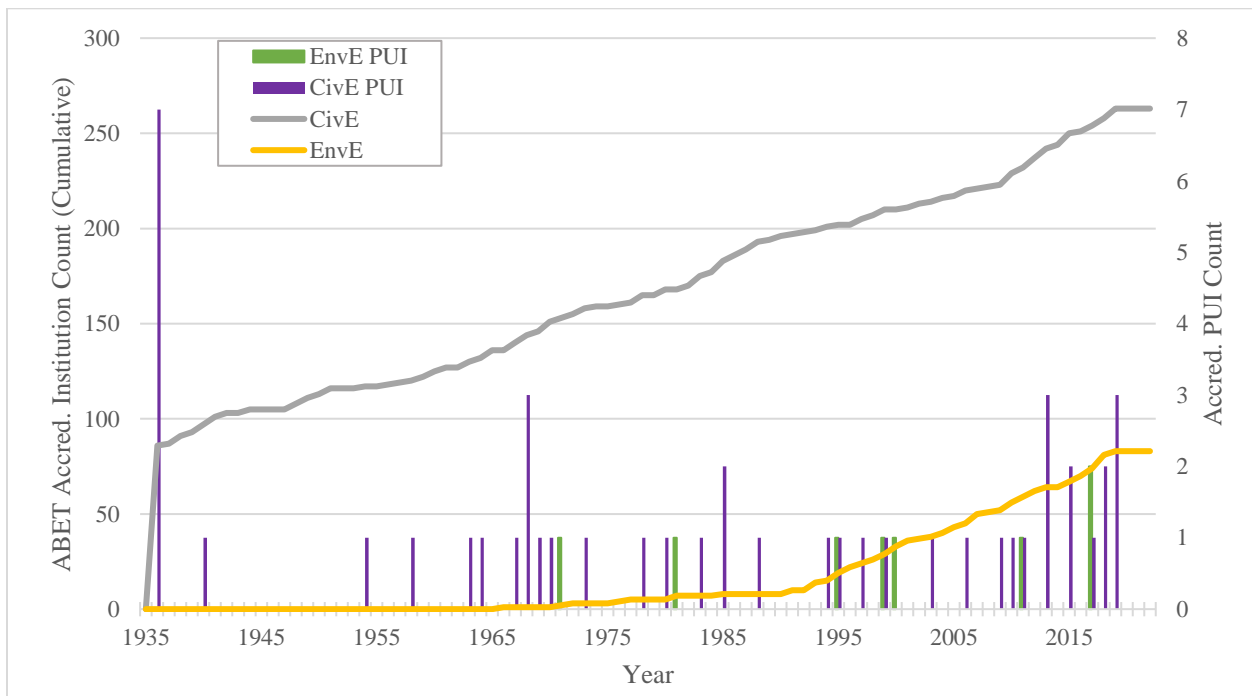


Figure 1: Line graphs are cumulative number of ABET accredited CivE and EnvE programs (left axis) from 1936 (the first year of ABET accreditation) to present. Bar graphs are count of CivE and EnvE programs at PUIs that were accredited (right axis) per year. EnvE programs shown with yellow line and green bars while CivE programs shown in gray line and purple bars.

Many students select colleges and universities that are in close proximity to their home. In private sector research, it has been found that affordability is the second most important college selection factor following major availability [31]. Proximity to home allows students to benefit from “in-state” tuition rates when available. Some students may even opt to attend college in their hometown in order to decrease cost of living by commuting. Thus, in addition to tabulating the temporal spread of accredited EnvE and CivE programs in the US, it is important to note the spatial distribution. Figure 2 shows the distribution of EnvE programs and designates the EnvE PUIs. Figure 3 replicates the process for CivE programs. Both general spatial distributions are predictable based on known population densities and urban center locations in the US. High population urban areas and older cities are more likely to host colleges and universities. The distribution of PUIs generally follow the overall program distribution trends, however CivE PUIs seem to have a slightly higher concentration in the region around Illinois. Further, due to the paucity of accredited EnvE PUIs, large segments of the country are completely unserved. The southern US, Great Plains, and Pacific Northwest regions do not have any EnvE programs at PUIs. There are doctoral-granting EnvE programs in these regions as well as CivE PUI programs where students may be able to complete a CivE curriculum while specializing in EnvE topics.

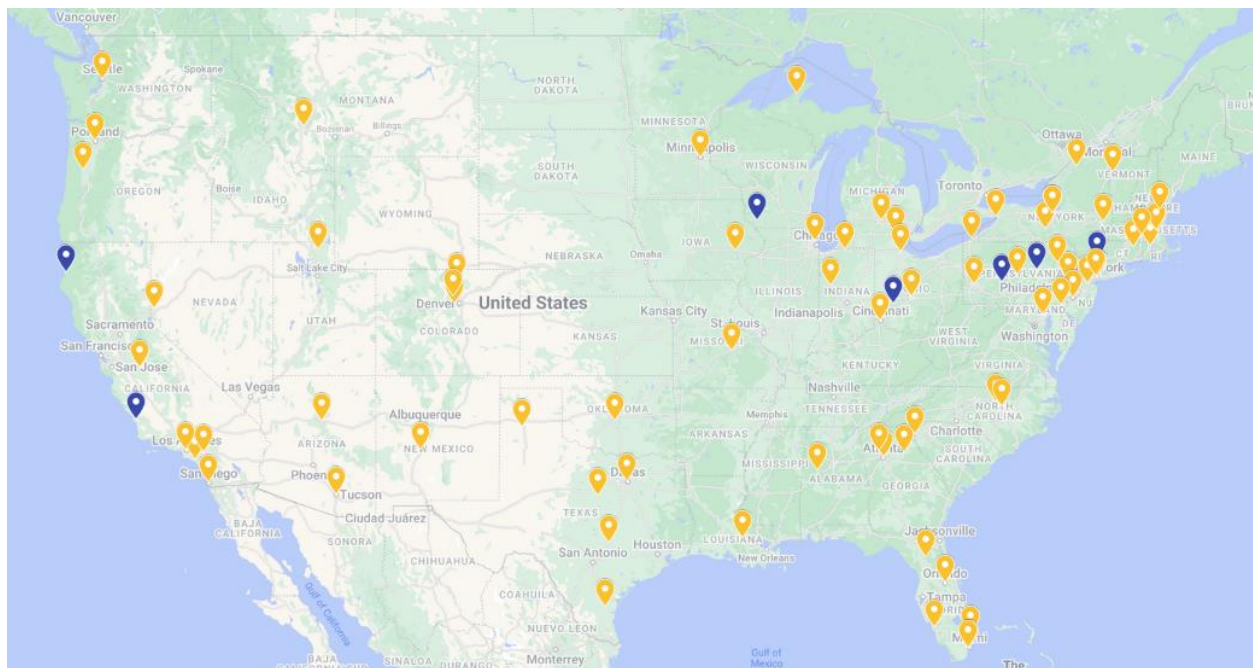


Figure 2: Distribution of EnvE programs in the continental US. Yellow indicators show location of doctoral degree granting ABET accredited EnvE programs. Blue indicators show location of ABET accredited EnvE programs at PUIs.

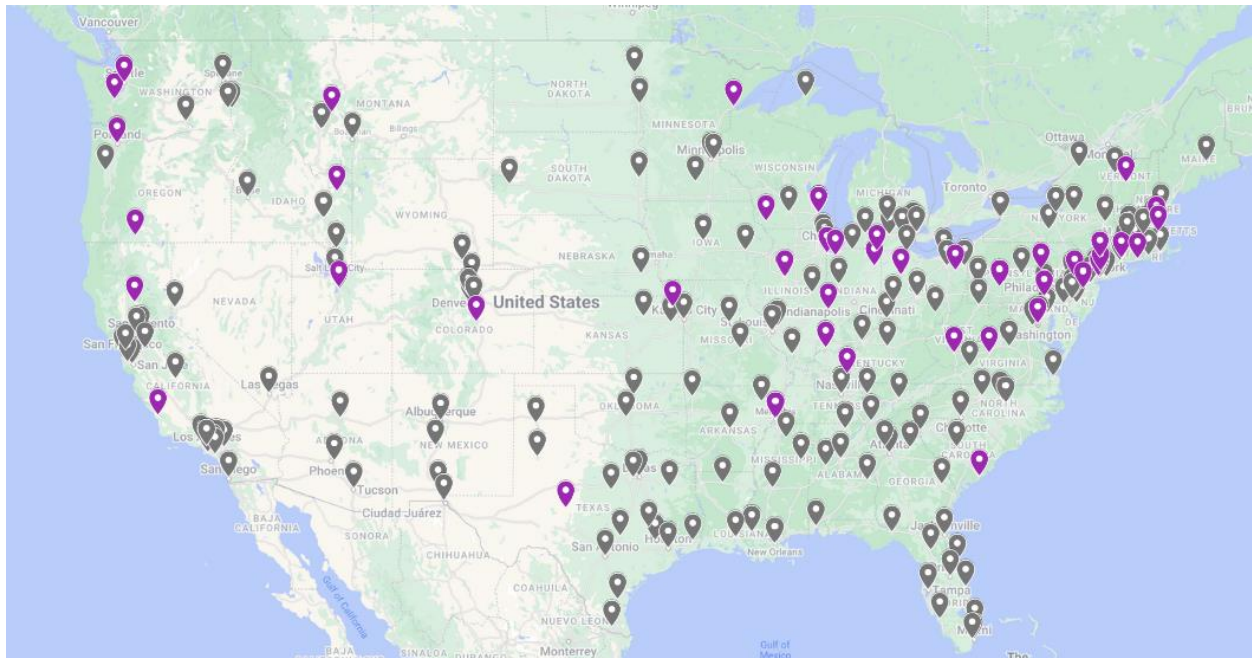


Figure 3: Distribution of CivE programs in the continental US. Gray indicators show location of doctoral degree granting ABET accredited CivE programs. Purple indicators show location of ABET accredited CivE programs at PUIs.

5.3 EnvE Specialization within CivE PUI Programs

The development of the EnvE field from the historic definition of CivE has led to many CivE accredited programs retaining course content that if separated into another major would form the basis of an EnvE program. Such topics include: hydrology, water treatment technologies, air quality management, and solid waste management. Even fields such as geotechnical engineering can bridge across the distinction of CivE and EnvE depending on whether the course content emphasis is on more structural elements (such as foundation design) versus soil properties (that influence soil remediation and groundwater transport). As such, identification of CivE programs that allow a student to specialize in EnvE topics may pose an alternative path to the EnvE career field for students. While there are distinctions in accreditation standards between an EnvE and CivE major, many fundamental skills are common.

Investigation of the course catalogs and curriculum maps among the 45 CivE PUIs allows identification of the institutions where a CivE major can specialize in EnvE topics. Five CivE PUIs are institutions that also have an accredited EnvE major (Table 1). A student electing to specialize in EnvE topics would likely change majors. Further, six institutions have no substantial customization of their CivE course curriculum to allow EnvE specialization, or not enough environmental engineering courses provided as elective options to fill every required engineering elective spot in the curriculum. These programs tend to advertise themselves as “broad-based” degrees where students are all given equal exposure to subdisciplines within CivE. These institutions include: The Citadel, University of Mount Union, Norwich University,

Saint Martin’s University, United States Coast Guard Academy, and West Virginia University Institute of Technology.

The remaining 34 CivE PUIs offer various levels to which students could customize their CivE curriculum to specialize in EnvE topics. This includes both formal “declared” specializations- alternatively called an “emphasis”, “specialty”, “concentration”, or “minor”- and informal specializations through engineering elective course selection. Among the 11 “formal” specialization programs, two models are present: (1) have at least three “engineering elective” courses in curriculum and require students to take multiple electives in a declared specialization area or (2) have permanent parallel course work for students in the declared specialization areas. For example, Seattle University students can major in “Civil Engineering with a Specialization in Environmental Engineering.” These students have a curriculum that does not include junior and senior level structural engineering courses and instead requires environmental biology and waste treatment technologies courses. The 23 “informal specialization” CivE PUIs require students to take three or more engineering electives but do not require the students to select most (or all) from a subdiscipline designated list. These schools may provide a general list of elective options to students without categorization. These programs are classified as allowing “unofficial specialization” rather than “no specialization” if the general list contains sufficient courses that a student would opt to take an EnvE course topic for every required elective space in the curriculum. A CivE program that requires four engineering electives but only has two environmental engineering elective courses would have been classified as “no EnvE specialization”.

Table 1: Among CivE PUI, the degree to which a CivE major could customize their coursework to specialize in EnvE. Four categories include: (1) PUI where both CivE and EnvE programs are present, (2) no customization or limited ability to specialize in EnvE, (3) formal specialization pathway through declaration of a “concentration” or “specialty”, and (4) informal specialization through student selection of EnvE courses as electives.

Both CivE and EnvE	Formal Specialization	Informal Specialization	
1. Bucknell University 2. California Polytechnic State University-San Luis Obispo 3. Universidad Politecnica de Puerto Rico 4. United States Military Academy 5. University of Wisconsin-Platteville	1. Oregon Institute of Technology 2. Carroll College 3. Seattle University 4. Milwaukee School of Engineering 5. Ohio Northern University 6. Manhattan College 7. University of Portland 8. Rose-Hulman Institute of Technology 9. Lafayette College 10. Cooper Union for the Advancement of Science and Art 11. University of Evansville	1. Angelo State University 2. Benedictine College 3. Bradley University 4. Brigham Young University-Idaho 5. California State University-Chico 6. Christian Brothers University 7. University of the District of Columbia 8. Merrimack College 9. University of Minnesota-Duluth 10. The College of New Jersey 11. University of Pittsburgh-Johnstown 12. Purdue University Northwest	13. Purdue University Fort Wayne 14. Quinnipiac University 15. University of Southern Indiana 16. Trine University 17. United States Air Force Academy 18. Utah Valley University 19. Valparaiso University 20. Virginia Military Institute 21. Wentworth Institute of Technology 22. Western Kentucky University 23. York College of Pennsylvania
No EnvE Specialization			
1. Citadel Military College of South Carolina 2. University of Mount Union 3. Norwich University 4. Saint Martin’s University 5. United States Coast Guard Academy 6. West Virginia University Institute of Technology			

5.4 Curricular Comparison of EnvE PUI Program to CivE PUI with EnvE Specialization

As previously stated, EnvE is a relatively new engineering discipline and was formed at the interface of several other disciplines. Per the EnvE BOK, traditional areas of competence include air quality, water quality, water/wastewater transport & treatment, stormwater management, air pollution control, solid waste management, hazardous waste management, contaminated site remediation, and environmental health [11]. These categories are echoed in the ABET Environmental Engineering curriculum standards: (a) mathematics, fundamental sciences, and fluid mechanics, (b) material and energy balance, fate and transport in/between air, water, and soil phases, (c) hands on experiments and data analysis, (d) design of systems considering risk, uncertainty, sustainability, etc., and (e) professional practice and project management including policy and regulation [32]. These categories form the basis of course groupings shown in Table 2. Among the eight EnvE PUIs, three were selected for direct curricular comparison – Cal Poly Humboldt, Saint Francis, and UW-Platteville. These three cover the temporal and spatial variation of EnvE PUIs. Two are public, state-supported institutions while one is private and religious-affiliated.

All three programs have some assortment of required and elective courses. There are several key observations about the breadth and depth of required and available courses in each category (Table 2). All three programs require at least five mathematics courses including calculus and statistics (as required by ABET), but two of the three have courses specifically designed for computer-based computational techniques. All three programs have at least four required fundamental science courses (at least two chemistry courses, one biology, and one physics), but it is more likely that students would complete between five and eight courses. Except for Environmental Biotechnology taught at Saint Francis (which could arguably be in another category) all courses are taught by other departments. Such major requirements in another department allow the EnvE department to increase enrollment in the program without needing to hire additional faculty, an efficiency for smaller PUIs. All programs require some sort of senior design capstone course per ABET requirements. Saint Francis does this through a two-course sequence (ENVE 497 and 498) while Cal Poly Humboldt and UW-Platteville each have a one course capstone. Cal Poly Humboldt, however, offers an additional elective design project course for seniors. At another institution this could be called an independent design project based on the course description in the catalog.

Regarding water management and treatment, all programs offer a wide variety of course work. Due to the growth of EnvE from sanitary engineering (historically water and wastewater management and treatment) the abundance of available courses is logical. All three require fluid mechanics (in line with ABET requirements) and one hydrology course. Among additional water management and treatment courses, Cal Poly Humboldt allows the most freedom of choice. The second list in their curricular requirements, titled “Engineering Design”, includes 17 course options covering virtually all of the EnvE subdisciplines, eight of which are water focused. UW-Platteville requires the most breadth within water treatment and management courses. Likewise, while all three programs offer at least one course in “Air, Solid, & Hazardous Waste”, only UW-Platteville explicitly required their Air and Waste Management course.

For the remaining EnvE subdisciplines (soil, energy, sustainable design, and environmental health and policy), only Cal Poly Humboldt and UW Platteville offer courses. Cal Poly Humboldt requires students take “Environmental Health and Impact Assessment” while UW-Platteville requires “Geotechnical Engineering” and the balance of courses are electives. Saint Francis requires an EnvE seminar each semester (total eight courses) which may discuss some of these other subdisciplines but that is not clear from the course descriptions. This program does explicitly have coursework to train EnvE students in applied laboratory methods while this is presumably taught within other courses at UW-Platteville and Cal Poly Humboldt. All three programs require Statics, but Dynamics and Mechanics of Materials coursework are electives at Saint Francis. For UW-Platteville, which offers both an EnvE and a CivE major, a higher count of General Engineering coded coursework likely represents another faculty workload efficiency for the school.

Table 2: Curricular Comparison between sample of three EnvE PUI Programs. “R” indicates a required course. “P1.2” indicates pick 2 courses from list 1 for that program.

	Saint Francis Courses		Cal Poly Humboldt Courses		UW Platteville Courses	
Math, Data Processing, Computational Methods	R	MATH 121 - Calculus I	R	MATH 109 - Calculus I	R	MATH 2640 - Calculus I
	R	MATH 122 - Calculus II	R	MATH 110 - Calculus II	R	MATH 2740 - Calculus II
	R	MATH 221 - Calculus III	R	MATH 210 - Calculus III	R	MATH 2840 - Calculus III
	R	MATH 306 - Ordinary Differential Equations I	R	ENGR 225 - Computational Methods for EnvE I	R	MATH 3630 - Differential Equations I
	R	ENVE 201 - EnvE Statistics Laboratory	R	ENGR 325 - Comp. Methods for EnvE II	R	MATH 4030 - Statistical Methods with Applications
			R	ENGR 326 - Comp. Methods for EnvE III	R	CIVILENG 2220 - CEE Computer Applications
			R	ENGR 313 - Systems Analysis		
			R	ENGR 322 - Environ. Data Model. & Analysis		
			P2.3	ENGR 421 - Adv. Numerical Method for EGR I		
Fundamental and Applied Sciences	R	CHEM 121 - General Chemistry I	R	BIOL 105 - Principles of Biology	R	CHEMISTRY 1450 - Chemistry for Engineers
	R	CHEM 122 - General Chemistry II	R	CHEM 109 - General Chemistry I	R	CHEMISTRY 3130 - Environmental Chemistry
	R	CHEM 221 - Organic Chemistry I	R	CHEM 110 - General Chemistry II	R	CHEMISTRY 3110 - Environmental Chemistry Lab
	R	GEOL 205 - Physical and Structural Geology	R	PHYX 211 - General Physics C: Elec & Mag	R	PHYSICS 2240 - General Physics I
	R	PHYS 121 - General Physics I	P1.1	BIOL 330 - Principles of Ecology	R	BIOLOGY 3240 - Microbiology
	R	PHYS 122 - General Physics II	P1.1	CHEM 341 - Quantitative Analysis	P2.3	BIOLOGY 3750 - Freshwater Biology
	P3.1	BIOL 203 - Ecology	P1.1	CHEM 370 - Earth System Chemistry	P2.3	BIOLOGY 3450 - Ecology and Evolution
	P3.1	BIOL 302 - General Microbiology	P1.1	FISH 320 - Limnology	P2.3	RECLAM 3410 - Wetland Ecology, Restor. & Mgmt
	P3.1	BIOL 322 - Field Biology	P1.1	PHYX 315 - Intro. to Electronics	P2.3	CHEMISTRY 3540 - Organic Chemistry I
	P3.1	ENVE 350 - Environmental Biotechnology			P2.3	CHEMISTRY 2150 - Quantitative Analysis
	P4.2	CHEM 251 - Quantitative Chemical Analysis			P2.3	CHEMISTRY 4240 - Instrumental Analysis
Capstone & Design	R	ENVE 497 - Capstone Design Proposal	R	ENGR 492 - Capstone Design Project	R	CIVILENG 4930 - CEE Design Project
	R	ENVE 498 - Capstone Design	P2.3	ENGR 498 - Directed Design Project		
Materials & Energy Balance	R	ENVE 311 - Aquatic and Atmospheric Chem.	R	ENGR 331 - Thermo. & Energy Systems I	R	ENVENG 3340 - Environmental Engineering
	R	ENVE 312 - Transport Processes	R	ENGR 351 - Introduction to Water Quality	P2.3	GENENG 2630 - Basic Thermoscience for Engineers
	R	PHYS 321 - Thermodynamics	R	ENGR 115 - Intro to Environ. Resources EGR	P2.3	or MECHENG 2630 - Thermodynamics
	R	ENVE 313 - Model & Sim. of Environ. Syst.	R	ENGR 416 - Transport Phenomena		
Water Management & Treatment	R	ENGR 301 - Fluid Mechanics	R	ENGR 333 - Fluid Mechanics	R	CIVILENG 3300 - Fluid Mechanics
	R	ENVE 411 - Wastewater Treatment	R	ENGR 440 - Hydrology I	R	ENVENG 4300 - Hydrology
	R	ENVE 413 - Environ. Hydraulics & Hydrology	P2.3	ENGR 418 - Applied Hydraulics	R	ENVENG 4310 - Groundwater Hydrology
	P1.1	ENVE 417 - Contaminant Hydrogeology	P2.3	ENGR 441 - Hydrology II	R	ENVENG 4400 - Municipal Hydraulics
	P2.1	ENVE 418 - Stormwater Treatment	P2.3	ENGR 443 - Groundwater Hydrology	R	ENVENG 4410 - Wastewater Treat. & Mgmt
	P2.1	ENVE 419 - Biological Processing	P2.3	ENGR 445 - Water Resources Plan. & Mgmt	R	ENVENG 4420 - Water Supply and Treatment
	P2.1	ENVE 425 - Drinking Water Treat. & Dist.	P2.3	ENGR 448 - River Hydraulics	P2.3	CIVILENG 4640 - Site Design and Stormwater Mgmt
			P2.3	ENGR 452 - Drinking Water Treatment EGR		
			P2.3	ENGR 453 - Wastewater Treatment Engineering		
		P2.3	ENGR 455 - EGR Natural Treatment Systems			

	Saint Francis Courses		Cal Poly Humboldt Courses		UW Platteville Courses	
Air & Solid Waste	P1.1	ENVE 416 - Air Quality Control	P2.3	ENGR 434 - Air Quality Management	R	ENVENG 4330 - Air and Waste Management
	P1.1	ENVE 414 - Hazardous & Solid Waste Handle	P2.3	ENGR 436 - Solid Waste Engineering		
	P2.1	ENVE 420 - Acid Mine Drain. Prevent & Treat.				
Soil Quality & Management			P1.1	SOIL 360 - Origin and Classification of Soils	R	CIVILENG 3740 - Geotechnical Engineering I
			P1.1	SOIL 363 - Wetland Soils	P1.1	GEOLOGY 1140 - Physical Geology
			P1.1	GEOL 303 - Earth Res & Glob Environ. Change	P1.1	GEOLOGY 3130 - Geology for Engineers
			P1.1	GEOL 306 - General Geomorphology	P1.1	SCSCI 2230 - Soils
					P2.3	SCSCI 3340 - Soil Nutrient Management
					P2.3	SCSCI 4350 - Soil and Water Conservation
Energy Systems			P2.3	ENGR 471 - Thermodynamics & Energy Syst II	P2.3	ENERGY 2340 - Fundamentals of Energy Sources
			P2.3	ENGR 473 - Building Energy Analysis	P2.3	ENERGY 3230 - Biorenewable Resources
			P2.3	ENGR 475 - Renewable Energy Power Systems	P2.3	ENERGY 3320 - Understanding Electric Power Syst.
			P2.3	ENGR 478 - Elect. Grids & Dist. Renew. Energy		
Green Design					P2.3	ENERGY 3130 - Sustain.: Ecol., Resource & Pract.
					P2.3	ENERGY 3430 - Green Building Design
Environ. Health & Policy			R	ENGR 410 - Environ. Health & Impact Assess.	P2.3	INDUSTDY 1010 - Principles of Safety & Risk Mgmt
					P2.3	INDUSTDY 3180 - Construction Safety Management
					P2.3	INDUSTDY 3590 - Industrial Hygiene and PPE
					P2.3	RECLAM 3880 - Environmental Law
General Professional Skills & EGR History	R	ENVE 192 - Freshman EnvE Seminar			R	GENENG 1030 - Introduction to Engineering Projects
	R	ENVE 193 - Freshman EnvE Seminar			R	CIVILENG 2000 - Introduction to Infrastructure
	R	ENVE 292 - Sophomore EnvE Seminar			R	GENENG 2820 - Engineering Economy
	R	ENVE 293 - Sophomore EnvE Seminar			P2.3	ACCTING 2010 - Financial Accounting
	R	ENVE 392 - Junior EnvE Seminar			P2.3	BUSADMIN 2330 - Leadership and Management
	R	ENVE 393 - Junior EnvE Seminar			P2.3	INDSTENG 4430 - Quality Engineering
	R	ENVE 492 - Senior EnvE Seminar			P2.3	ENTRP 2020 - Startup Launchpad
	R	ENVE 493 - Senior EnvE Seminar			P2.3	BUSADMIN 3130 - Legal Environment of Business
EnvE Lab. Skills	R	ENVE 321 - EnvE Measurements I			P2.3	ENVENG 4940 - Undergraduate Research
	R	ENVE 322 - EnvE Measurements II				
	R	ENVE 415 - Senior Lab				
General Engineering Principles	R	ENGR 101 - Intro. to Engineering Concepts I	R	ENGR 210 - Solid Mechanics: Statics	R	GENENG 1320 - Engineering Computer Graphics
	R	ENGR 102 - Intro. to Engineering Concepts II	R	ENGR 211 - Solid Mechanics: Dynamics	R	GENENG 2130 - Engineering Mechanics-Statics
	R	ENGR 201 - Engineering Statics	R	ENGR 215 - Introduction to Design	R	GENENG 2340 - Mechanics of Materials
	P4.2	ENGR 202 - Engineering Dynamics	R	ENGR 330 - Mechanics & Science of Materials	R	CIVILENG 2630 - Elements of Surveying
	P4.2	ENGR 350 - Material Science			P2.3	CIVILENG 4630 - Geographic Information Systems
	P4.2	ENGR 315/315L - Mechanics of Materials/Lab			P2.3	GEOGRPHY 3230 - Geographic Information Systems
					P2.3	CIVILENG 3020 - Construction Engineering
				P2.3	CIVILENG 3030 - Construction Materials	

6. Conclusions

This study presents data on ABET accredited EnvE education in the US at present with a focus on PUIs. The first research question- how many EnvE PUI programs exist and what is their distribution - is addressed. Of the total 83 ABET accredited EnvE programs in the US, only 8 are at PUIs. PUI, defined for the purposes of this study, is an institution that does not grant research-based doctoral degrees. If colleges and universities granting at least 50 master's degrees per year are eliminated, only three EnvE programs remain. The first ABET accredited EnvE program was in 1966 and the first of the eight EnvE PUIs was accredited in 1971. The pace of EnvE program accreditation has increased since 1990 and now seems to outpace CivE program accreditation, however this is in accordance with the developmental history of these academic disciplines. Spatially, EnvE PUIs have a limited distribution. Such programs are in California and the Northeast/Great Lakes regions, but are absent from the Southern, Great Plains, and Pacific Northwest regions entirely. These spatial gaps align with the relatively lower number of doctoral EnvE institutions and even CivE PUIs in these regions.

Historically, the environmental engineering discipline developed, in part, from the civil engineering discipline. CivE programs were among the first to be accredited by ABET and continue to remain more prevalent in the US compared to EnvE programs (both in doctoral institutions and PUIs). Thus, for a student or faculty member who wishes to pursue EnvE topics in a PUI, the ability to customize a CivE major with EnvE courses may fill a gap as EnvE programs continue to develop. Addressing this second research question, there are 45 CivE accredited PUIs. Among these, five programs coexist at an institution that also offers an accredited EnvE degree. A further six do not offer any customization of their curriculum, or lack sufficient listed environmental engineering relative elective courses to fill all required electives. The remaining 34 CivE programs allow formal or informal customization of the curriculum to focus on environmental topics. Formal methods include declaration of a "minor" or "concentration" to fulfill engineering elective requirements. Informal specialization is defined as a curriculum with three or more required elective courses and sufficient environmental engineering disciplinary courses offered for a student to opt for an EnvE course for every elective.

A preliminary curricular comparison between EnvE PUIs is presented. It shows the expected dependence on faculty from other complementary departments (such as Chemistry) to supplement the content requirements of ABET without increasing the faculty workload within the department. In terms of the breadth of EnvE subdisciplines that can be addressed at a PUI, further investigation is needed. Are the "gaps" in content due to the difficulty level of the content in those fields making it impossible to accommodate at the undergraduate level? Are the gaps due to the limited amount of faculty at PUI institutions and thus the limitations of faculty experience? Would such gaps still exist if the EnvE major was present at a doctoral institution? Such questions can be addressed in future work.

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Appendix A: Table of EnVE ABET Accredited Programs, PUI programs are highlighted in grey.

Institution Name	Research Doctoral (RD) or PUI	Carnegie Classification	Institutional Specialization	City	State	Accred. Year
1. Brown University	RD	Doctoral		Providence	Rhode Island	2018
2. Bucknell University	PUI	Baccalaureate		Lewisburg	Pennsylvania	2017
3. California Polytechnic State University-San Luis Obispo	PUI	Master's		San Luis Obispo	California	1971
4. California State Polytechnic University-Humboldt	PUI	Master's	HSI	Arcata	California	1981
5. Central State University	PUI	Baccalaureate	Land Grant, HBCU	Wilberforce	Ohio	2017
6. Clarkson University	RD	Doctoral		Potsdam	New York	2007
7. Clemson University	RD	Doctoral	Land Grant	Clemson	South Carolina	2012
8. Colorado School of Mines	RD	Doctoral		Golden	Colorado	2012
9. Colorado State University-Fort Collins	RD	Doctoral	Land Grant	Fort Collins	Colorado	2000
10. Columbia University in the City of New York	RD	Doctoral		New York	New York	1999
11. Cornell University	RD	Doctoral	Land Grant	Ithaca	New York	2007
12. CUNY City College	RD	Doctoral	HSI	New York	New York	2009
13. Drexel University	RD	Doctoral		Philadelphia	Pennsylvania	2000
14. Duke University	RD	Doctoral		Durham	North Carolina	2015
15. Florida Atlantic University	RD	Doctoral		Boca Raton	Florida	2018
16. Florida Gulf Coast University	RD	Professional/ Doctoral		Fort Myers	Florida	2008
17. Florida International University	RD	Doctoral	HSI	Miami	Florida	2006
18. Gannon University	RD	Professional/ Doctoral		Erie	Pennsylvania	2003
19. Georgia Institute of Technology-Main Campus	RD	Doctoral		Atlanta	Georgia	2007
20. Johns Hopkins University	RD	Doctoral		Baltimore	Maryland	2004
21. Kennesaw State University	RD	Doctoral		Kennesaw	Georgia	2017
22. Lehigh University	RD	Doctoral		Bethlehem	Pennsylvania	2005
23. Louisiana State University and Agricultural & Mechanical College	RD	Doctoral	Land Grant	Baton Rouge	Louisiana	1996
24. Michigan State University	RD	Doctoral	Land Grant	East Lansing	Michigan	2011
25. Michigan Technological University	RD	Doctoral		Houghton	Michigan	1985

Institution Name	Research Doctoral (RD) or PUI	Carnegie Classification	Institutional Specialization	City	State	Accred. Year
26. Missouri University of Science and Technology	RD	Doctoral		Rolla	Missouri	2005
27. Montana Technological University	RD	Master's		Butte	Montana	1981
28. New Mexico Institute of Mining and Technology	RD	Master's	HSI	Socorro	New Mexico	1991
29. North Carolina State University at Raleigh	RD	Doctoral	Land Grant	Raleigh	North Carolina	1993
30. Northeastern University	RD	Doctoral		Boston	Massachusetts	2018
31. Northern Arizona University	RD	Doctoral		Flagstaff	Arizona	1994
32. Northwestern University	RD	Doctoral		Evanston	Illinois	1976
33. Ohio State University-Main Campus	RD	Doctoral	Land Grant	Columbus	Ohio	2010
34. Oregon State University	RD	Doctoral	Land Grant	Corvallis	Oregon	1996
35. Portland State University	RD	Doctoral		Portland	Oregon	2010
36. Purdue University-Main Campus	RD	Doctoral	Land Grant	West Lafayette	Indiana	2012
37. Rensselaer Polytechnic Institute	RD	Doctoral		Troy	New York	1966
38. Rutgers University-New Brunswick	RD	Doctoral	Land Grant	New Brunswick	New Jersey	2007
39. Saint Francis University	PUI	Master's		Loretto	Pennsylvania	2011
40. San Diego State University	RD	Doctoral	HSI	San Diego	California	2002
41. Southern Methodist University	RD	Doctoral		Dallas	Texas	2001
42. Stevens Institute of Technology	RD	Doctoral		Hoboken	New Jersey	1993
43. SUNY College of Environmental Science and Forestry	RD	Doctoral		Syracuse	New York	2010
44. Syracuse University	RD	Doctoral		Syracuse	New York	1991
45. Tarleton State University	RD	Doctoral		Stephenville	Texas	2007
46. Temple University	RD	Doctoral		Philadelphia	Pennsylvania	2019
47. Texas A & M University-Kingsville	RD	Doctoral	HSI	Kingsville	Texas	2011
48. The Pennsylvania State University	RD	Doctoral	Land Grant	University Park	Pennsylvania	2000
49. The University of Alabama	RD	Doctoral		Tuscaloosa	Alabama	2015
50. The University of Texas at Austin	RD	Doctoral		Austin	Texas	2019
51. Tufts University	RD	Doctoral		Medford	Massachusetts	1995
52. United States Military Academy	PUI	Baccalaureate	MLTY	West Point	New York	1995
53. Universidad Politecnica de Puerto Rico	PUI	Master's	HSI	San Juan	Puerto Rico	2000
54. University at Buffalo	RD	Doctoral		Buffalo	New York	2001

Institution Name	Research Doctoral (RD) or PUI	Carnegie Classification	Institutional Specialization	City	State	Accred. Year
55. University of Arizona	RD	Doctoral	Land Grant	Tucson	Arizona	2018
56. University of California-Irvine	RD	Doctoral	Land Grant	Irvine	California	1997
57. University of California-Merced	RD	Doctoral	Land Grant	Merced	California	2013
58. University of California-Riverside	RD	Doctoral	Land Grant, HIS	Riverside	California	1993
59. University of Central Florida	RD	Doctoral		Orlando	Florida	1972
60. University of Cincinnati-Main Campus	RD	Doctoral		Cincinnati	Ohio	2017
61. University of Colorado Boulder	RD	Doctoral		Boulder	Colorado	2001
62. University of Connecticut	RD	Doctoral	Land Grant	Storrs	Connecticut	2005
63. University of Delaware	RD	Doctoral	Land Grant	Newark	Delaware	1998
64. University of Florida	RD	Doctoral	Land Grant	Gainesville	Florida	1977
65. University of Georgia	RD	Doctoral	Land Grant	Athens	Georgia	2010
66. University of Iowa	RD	Doctoral		Iowa City	Iowa	2018
67. University of Miami	RD	Doctoral		Coral Gables	Florida	1997
68. University of Michigan-Ann Arbor	RD	Doctoral		Ann Arbor	Michigan	2013
69. University of Minnesota-Twin Cities	RD	Doctoral	Land Grant	Minneapolis	Minnesota	2016
70. University of Nevada-Reno	RD	Doctoral	Land Grant	Reno	Nevada	1998
71. University of New Hampshire-Main Campus	RD	Doctoral	Land Grant	Durham	New Hampshire	1999
72. University of Notre Dame	RD	Doctoral		Notre Dame	Indiana	2015
73. University of Oklahoma-Norman Campus	RD	Doctoral		Norman	Oklahoma	1995
74. University of Pittsburgh-Pittsburgh Campus	RD	Doctoral		Pittsburgh	Pennsylvania	2016
75. University of Southern California	RD	Doctoral		Los Angeles	California	1996
76. University of Toledo	RD	Doctoral		Toledo	Ohio	2016
77. University of Vermont	RD	Doctoral	Land Grant	Burlington	Vermont	2004
78. University of Washington-Seattle Campus	RD	Doctoral		Seattle	Washington	2018
79. University of Wisconsin-Platteville	PUI	Master's		Platteville	Wisconsin	1999
80. Utah State University	RD	Doctoral	Land Grant	Logan	Utah	1993
81. West Texas A & M University	RD	Master's		Canyon	Texas	2018
82. Wilkes University	RD	Professional/ Doctoral		Wilkes-Barre	Pennsylvania	1995
83. Worcester Polytechnic Institute	RD	Doctoral		Worcester	Massachusetts	2006

Appendix B: Table of CivE ABET Accredited Programs, PUI programs are highlighted in grey.

Institution Name	Research Doctoral (RD) or PUI	Carnegie Classification	Institutional Specialization	City	State	Accred. Year
1. Alabama A & M University	RD	Master's	Land Grant, HBCU	Huntsville	Alabama	1998
2. Angelo State University	PUI	Master's	HSI	San Angelo	Texas	2018
3. Arizona State University Campus Immersion	RD	Doctoral		Tempe	Arizona	1961
4. Arkansas State University	RD	Doctoral		Jonesboro	Arkansas	2010
5. Auburn University	RD	Doctoral	Land Grant	Auburn	Alabama	1941
6. Baker College	RD	Master's		Jackson	Michigan	2017
7. Benedictine College	PUI	Baccalaureate		Atchison	Kansas	2017
8. Boise State University	RD	Doctoral		Boise	Idaho	1997
9. Bradley University	PUI	Professional/ Doctoral		Peoria	Illinois	1963
10. Brigham Young University	RD	Doctoral		Provo	Utah	1960
11. Brigham Young University-Idaho	PUI	Baccalaureate		Rexburg	Idaho	2013
12. Bucknell University	PUI	Baccalaureate		Lewisburg	Pennsylvania	1936
13. California Baptist University	RD	Master's	HSI	Riverside	California	2010
14. California Polytechnic State University-San Luis Obispo	PUI	Master's		San Luis Obispo	California	1973
15. California State Polytechnic University-Pomona	RD	Master's		Pomona	California	1970
16. California State Polytechnic University-Pomona	RD	Master's		Pomona	California	1992
17. California State University-Chico	PUI	Master's	HSI	Chico	California	1968
18. California State University-Fresno	RD	Doctoral		Fresno	California	1968
19. California State University-Fullerton	RD	Doctoral		Fullerton	California	1985
20. California State University-Long Beach	RD	Doctoral		Long Beach	California	1963
21. California State University-Los Angeles	RD	Master's	HSI	Los Angeles	California	1965
22. California State University-Northridge	RD	Master's	HSI	Northridge	California	1994
23. California State University-Sacramento	RD	Master's	HSI	Sacramento	California	1965
24. Caribbean University-Bayamon	RD	Master's	HSI	Bayamon	Puerto Rico	2013
25. Carnegie Mellon University	RD	Doctoral		Pittsburgh	Pennsylvania	1936
26. Carroll College	PUI	Baccalaureate		Helena	Montana	1999
27. Case Western Reserve University	RD	Doctoral		Cleveland	Ohio	1936

28. Central Connecticut State University	RD	Master's		New Britain	Connecticut	2011
29. Christian Brothers University	PUI	Master's		Memphis	Tennessee	1983
30. Citadel Military College of South Carolina	PUI	Master's	MLTY	Charleston	South Carolina	1936
31. Clarkson University	RD	Doctoral		Potsdam	New York	1936
32. Clemson University	RD	Doctoral	Land Grant	Clemson	South Carolina	1936
33. Cleveland State University	RD	Doctoral		Cleveland	Ohio	1948
34. Colorado School of Mines	RD	Doctoral		Golden	Colorado	2012
35. Colorado State University-Fort Collins	RD	Doctoral	Land Grant	Fort Collins	Colorado	1938
36. Columbia University in the City of New York	RD	Doctoral		New York	New York	1936
37. Cooper Union for the Advancement of Science and Art	PUI	Baccalaureate		New York	New York	1936
38. Cornell University	RD	Doctoral	Land Grant	Ithaca	New York	1936
39. CUNY City College	RD	Doctoral	HSI	New York	New York	1936
40. Drexel University	RD	Doctoral		Philadelphia	Pennsylvania	1936
41. Duke University	RD	Doctoral		Durham	North Carolina	1936
42. Embry-Riddle Aeronautical University-Daytona Beach	RD	Master's		Daytona Beach	Florida	1997
43. Florida Agricultural and Mechanical University	RD	Doctoral	Land Grant, HBCU	Tallahassee	Florida	1986
44. Florida Atlantic University	RD	Doctoral		Boca Raton	Florida	2002
45. Florida Gulf Coast University	RD	Professional/ Doctoral		Fort Myers	Florida	2008
46. Florida Institute of Technology	RD	Doctoral		Melbourne	Florida	1983
47. Florida International University	RD	Doctoral	HSI	Miami	Florida	1985
48. George Mason University	RD	Doctoral		Fairfax	Virginia	1993
49. George Washington University	RD	Doctoral		Washington	District of Columbia	1940
50. Georgia Institute of Technology-Main Campus	RD	Doctoral		Atlanta	Georgia	1936
51. Georgia Southern University	RD	Doctoral		Statesboro	Georgia	2012
52. Gonzaga University	RD	Professional/ Doctoral		Spokane	Washington	1985
53. Hofstra University	RD	Professional/ Doctoral		Hempstead	New York	2019
54. Howard University	RD	Doctoral	HBCU	Washington	District of Columbia	1936
55. Idaho State University	RD	Doctoral		Pocatello	Idaho	1998

56. Illinois Institute of Technology	RD	Doctoral		Chicago	Illinois	1936
57. Iowa State University	RD	Doctoral	Land Grant	Ames	Iowa	1936
58. Jackson State University	RD	Doctoral	HBCU	Jackson	Mississippi	2004
59. Johns Hopkins University	RD	Doctoral		Baltimore	Maryland	1936
60. Kansas State University	RD	Doctoral	Land Grant	Manhattan	Kansas	1936
61. Kennesaw State University	RD	Doctoral		Kennesaw	Georgia	2012
62. Lafayette College	PUI	Baccalaureate		Easton	Pennsylvania	1936
63. Lamar University	RD	Professional/ Doctoral		Beaumont	Texas	1961
64. Lawrence Technological University	RD	Master's		Southfield	Michigan	1991
65. Lehigh University	RD	Doctoral		Bethlehem	Pennsylvania	1936
66. Lipscomb University	RD	Professional/ Doctoral		Nashville	Tennessee	2011
67. Louisiana State University and Agricultural & Mechanical College	RD	Doctoral	Land Grant	Baton Rouge	Louisiana	1936
68. Louisiana Tech University	RD	Doctoral		Ruston	Louisiana	1948
69. Loyola Marymount University	RD	Doctoral		Los Angeles	California	1967
70. Manhattan College	PUI	Master's		Riverdale	New York	1940
71. Marquette University	RD	Doctoral		Milwaukee	Wisconsin	1936
72. Merrimack College	PUI	Master's		North Andover	Massachusetts	1964
73. Michigan State University	RD	Doctoral	Land Grant	East Lansing	Michigan	1936
74. Michigan Technological University	RD	Doctoral		Houghton	Michigan	1936
75. Milwaukee School of Engineering	PUI	Master's		Milwaukee	Wisconsin	2015
76. Minnesota State University-Mankato	RD	Master's		Mankato	Minnesota	2002
77. Mississippi State University	RD	Doctoral	Land Grant	Mississippi State	Mississippi	1941
78. Missouri University of Science and Technology	RD	Doctoral		Rolla	Missouri	1936
79. Montana State University	RD	Doctoral	Land Grant	Bozeman	Montana	1936
80. Montana Technological University	RD	Master's		Butte	Montana	2017
81. Morgan State University	RD	Doctoral	HBCU	Baltimore	Maryland	1990
82. New Jersey Institute of Technology	RD	Doctoral		Newark	New Jersey	1936
83. New Mexico Institute of Mining and Technology	RD	Master's	HSI	Socorro	New Mexico	2006
84. New Mexico State University-Main Campus	RD	Doctoral	Land Grant, HSI	Las Cruces	New Mexico	1938
85. New York University	RD	Doctoral		Brooklyn	New York	1936

86. New York University	RD	Doctoral		Brooklyn	New York	2014
87. North Carolina A & T State University	RD	Doctoral	Land Grant, HBCU	Greensboro	North Carolina	1990
88. North Carolina State University at Raleigh	RD	Doctoral	Land Grant	Raleigh	North Carolina	1936
89. North Dakota State University-Main Campus	RD	Doctoral	Land Grant	Fargo	North Dakota	1948
90. Northeastern University	RD	Doctoral		Boston	Massachusetts	1939
91. Northern Arizona University	RD	Doctoral		Flagstaff	Arizona	1974
92. Northwestern University	RD	Doctoral		Evanston	Illinois	1938
93. Norwich University	PUI	Master's	MLTY	Northfield	Vermont	1936
94. Ohio Northern University	PUI	Baccalaureate		Ada	Ohio	1954
95. Ohio State University-Main Campus	RD	Doctoral	Land Grant	Columbus	Ohio	1936
96. Ohio University-Main Campus	RD	Doctoral		Athens	Ohio	1951
97. Oklahoma State University-Main Campus	RD	Doctoral	Land Grant	Stillwater	Oklahoma	1936
98. Old Dominion University	RD	Doctoral		Norfolk	Virginia	1967
99. Oregon Institute of Technology	PUI	Baccalaureate		Klamath Falls	Oregon	1997
100. Oregon State University	RD	Doctoral	Land Grant	Corvallis	Oregon	1936
101. Portland State University	RD	Doctoral		Portland	Oregon	1982
102. Prairie View A & M University	RD	Doctoral	Land Grant, HBCU	Prairie View	Texas	1970
103. Princeton University	RD	Doctoral		Princeton	New Jersey	1936
104. Purdue University Fort Wayne	PUI	Master's		Fort Wayne	Indiana	2009
105. Purdue University Northwest	PUI	Master's		Hammond	Indiana	2010
106. Purdue University-Main Campus	RD	Doctoral	Land Grant	West Lafayette	Indiana	1936
107. Quinnipiac University	PUI	Professional/ Doctoral		Hamden	Connecticut	2015
108. Rensselaer Polytechnic Institute	RD	Doctoral		Troy	New York	1936
109. Rice University	RD	Doctoral		Houston	Texas	1936
110. Rose-Hulman Institute of Technology	PUI	Special Focus Four-Year		Terre Haute	Indiana	1936
111. Rowan University	RD	Doctoral		Glassboro	New Jersey	1999
112. Rutgers University-New Brunswick	RD	Doctoral	Land Grant	New Brunswick	New Jersey	1936
113. Saint Louis University	RD	Doctoral		Saint Louis	Missouri	2012
114. Saint Martin's University	PUI	Master's		Lacey	Washington	1969
115. San Diego State University	RD	Doctoral	HSI	San Diego	California	1964

116. San Francisco State University	RD	Doctoral		San Francisco	California	1986
117. San Jose State University	RD	Master's		San Jose	California	1959
118. Santa Clara University	RD	Professional/ Doctoral		Santa Clara	California	1936
119. Seattle University	PUI	Professional/ Doctoral		Seattle	Washington	1985
120. South Dakota School of Mines and Technology	RD	Master's		Rapid City	South Dakota	1936
121. South Dakota State University	RD	Doctoral	Land Grant	Brookings	South Dakota	1936
122. Southern Illinois University-Carbondale	RD	Doctoral		Carbondale	Illinois	1988
123. Southern Illinois University-Edwardsville	RD	Professional/ Doctoral		Edwardsville	Illinois	1973
124. Southern Methodist University	RD	Doctoral		Dallas	Texas	2005
125. Southern University and A & M College	RD	Doctoral	Land Grant, HBCU	Baton Rouge	Louisiana	1970
126. Stanford University	RD	Doctoral		Stanford	California	1936
127. Stevens Institute of Technology	RD	Doctoral		Hoboken	New Jersey	1987
128. Stony Brook University	RD	Doctoral		New York	New York	2015
129. SUNY Polytechnic Institute	RD	Master's		Utica	New York	2015
130. Syracuse University	RD	Doctoral		Syracuse	New York	1936
131. Tarleton State University	RD	Doctoral		Stephenville	Texas	2016
132. Temple University	RD	Doctoral		Philadelphia	Pennsylvania	1988
133. Tennessee State University	RD	Doctoral	Land Grant, HBCU	Nashville	Tennessee	1972
134. Tennessee Technological University	RD	Doctoral		Cookeville	Tennessee	1970
135. Texas A & M University-College Station	RD	Doctoral	Land Grant, HIS, MLTY	College Station	Texas	1936
136. Texas A & M University-Kingsville	RD	Doctoral	HSI	Kingsville	Texas	1980
137. Texas Tech University	RD	Doctoral		Lubbock	Texas	1937
138. The Catholic University of America	RD	Doctoral		Washington	District of Columbia	1938
139. The College of New Jersey	PUI	Master's		Ewing	New Jersey	2006
140. The Pennsylvania State University	RD	Doctoral	Land Grant	University Park	Pennsylvania	1936
141. The University of Alabama	RD	Doctoral		Tuscaloosa	Alabama	1936
142. The University of Tennessee-Chattanooga	RD	Professional/ Doctoral		Chattanooga	Tennessee	2006
143. The University of Tennessee-Knoxville	RD	Doctoral	Land Grant	Knoxville	Tennessee	1936

144. The University of Texas at Arlington	RD	Doctoral	HSI	Arlington	Texas	1967
145. The University of Texas at Austin	RD	Doctoral		Austin	Texas	1936
146. The University of Texas at El Paso	RD	Doctoral	HSI	El Paso	Texas	1965
147. The University of Texas at San Antonio	RD	Doctoral	HSI	San Antonio	Texas	1986
148. The University of Texas at Tyler	RD	Doctoral		Tyler	Texas	2007
149. The University of Texas Rio Grande Valley	RD	Doctoral	HSI	Edinburg	Texas	2010
150. Trine University	PUI	Baccalaureate		Angola	Indiana	1970
151. Tufts University	RD	Doctoral		Medford	Massachusetts	1936
152. United States Air Force Academy	PUI	Baccalaureate	MLTY	USAF A	Colorado	1967
153. United States Coast Guard Academy	PUI	Baccalaureate	MLTY	New London	Connecticut	1978
154. United States Military Academy	PUI	Baccalaureate	MLTY	West Point	New York	1985
155. Universidad Ana G. Mendez-Gurabo Campus	RD	Professional/ Doctoral	HSI	Gurabo	Puerto Rico	2015
156. Universidad Politecnica de Puerto Rico	PUI	Master's	HSI	San Juan	Puerto Rico	1994
157. University at Buffalo	RD	Doctoral		Buffalo	New York	1963
158. University of Akron Main Campus	RD	Doctoral		Akron	Ohio	1950
159. University of Alabama at Birmingham	RD	Doctoral		Birmingham	Alabama	1983
160. University of Alabama in Huntsville	RD	Doctoral		Huntsville	Alabama	1987
161. University of Alaska Anchorage	RD	Master's		Anchorage	Alaska	1984
162. University of Alaska Fairbanks	RD	Doctoral	Land Grant	Fairbanks	Alaska	1940
163. University of Arizona	RD	Doctoral	Land Grant	Tucson	Arizona	1936
164. University of Arkansas	RD	Doctoral	Land Grant	Fayetteville	Arkansas	1936
165. University of Arkansas at Little Rock	RD	Doctoral		Little Rock	Arkansas	2012
166. University of California-Berkeley	RD	Doctoral	Land Grant	Berkeley	California	1936
167. University of California-Davis	RD	Doctoral	Land Grant	Davis	California	1965
168. University of California-Irvine	RD	Doctoral	Land Grant	Irvine	California	1978
169. University of California-Los Angeles	RD	Doctoral	Land Grant	Los Angeles	California	1983
170. University of Central Florida	RD	Doctoral		Orlando	Florida	1982
171. University of Cincinnati-Main Campus	RD	Doctoral		Cincinnati	Ohio	1936
172. University of Colorado Boulder	RD	Doctoral		Boulder	Colorado	1936
173. University of Colorado Boulder	RD	Doctoral		Boulder	Colorado	2019

174. University of Colorado Denver/Anschutz Medical Campus	RD	Doctoral		Denver	Colorado	1976
175. University of Connecticut	RD	Doctoral	Land Grant	Storrs	Connecticut	1940
176. University of Dayton	RD	Doctoral		Dayton	Ohio	1951
177. University of Delaware	RD	Doctoral	Land Grant	Newark	Delaware	1936
178. University of Detroit Mercy	RD	Professional/ Doctoral		Detroit	Michigan	1936
179. University of Evansville	PUI	Master's		Evansville	Indiana	1995
180. University of Florida	RD	Doctoral	Land Grant	Gainesville	Florida	1936
181. University of Georgia	RD	Doctoral	Land Grant	Athens	Georgia	2014
182. University of Hartford	RD	Professional/ Doctoral		West Hartford	Connecticut	1978
183. University of Hawaii at Manoa	RD	Doctoral	Land Grant	Honolulu	Hawaii	1951
184. University of Houston	RD	Doctoral	HSI	Houston	Texas	1957
185. University of Idaho	RD	Doctoral	Land Grant	Moscow	Idaho	1936
186. University of Illinois Chicago	RD	Doctoral		Chicago	Illinois	1985
187. University of Illinois Urbana-Champaign	RD	Doctoral	Land Grant	Champaign	Illinois	1936
188. University of Iowa	RD	Doctoral		Iowa City	Iowa	1936
189. University of Kansas	RD	Doctoral		Lawrence	Kansas	1936
190. University of Kentucky	RD	Doctoral	Land Grant	Lexington	Kentucky	1936
191. University of Louisiana at Lafayette	RD	Doctoral		Lafayette	Louisiana	1956
192. University of Louisville	RD	Doctoral		Louisville	Kentucky	2010
193. University of Maine	RD	Doctoral	Land Grant	Orono	Maine	1936
194. University of Maryland-College Park	RD	Doctoral	Land Grant	College Park	Maryland	1936
195. University of Massachusetts-Amherst	RD	Doctoral	Land Grant	Amherst	Massachusetts	1949
196. University of Massachusetts-Dartmouth	RD	Doctoral		Dartmouth	Massachusetts	1972
197. University of Massachusetts-Lowell	RD	Doctoral		Lowell	Massachusetts	1977
198. University of Memphis	RD	Doctoral		Memphis	Tennessee	1971
199. University of Miami	RD	Doctoral		Coral Gables	Florida	1960
200. University of Michigan-Ann Arbor	RD	Doctoral		Ann Arbor	Michigan	1936
201. University of Minnesota-Duluth	PUI	Master's		Duluth	Minnesota	2011
202. University of Minnesota-Twin Cities	RD	Doctoral	Land Grant	Minneapolis	Minnesota	1936
203. University of Mississippi	RD	Doctoral		University	Mississippi	1949

204. University of Missouri-Columbia	RD	Doctoral	Land Grant	Columbia	Missouri	1936
205. University of Missouri-Kansas City	RD	Doctoral		Kansas City	Missouri	1978
206. University of Missouri-St Louis	RD	Doctoral		St. Louis	Missouri	1999
207. University of Mount Union	PUI	Master's		Alliance	Ohio	2013
208. University of Nebraska-Lincoln	RD	Doctoral	Land Grant	Lincoln	Nebraska	1936
209. University of Nevada-Las Vegas	RD	Doctoral		Las Vegas	Nevada	1987
210. University of Nevada-Reno	RD	Doctoral	Land Grant	Reno	Nevada	1949
211. University of New Hampshire-Main Campus	RD	Doctoral	Land Grant	Durham	New Hampshire	1936
212. University of New Haven	RD	Master's		West Haven	Connecticut	1973
213. University of New Mexico-Main Campus	RD	Doctoral	HSI	Albuquerque	New Mexico	1936
214. University of New Orleans	RD	Doctoral		New Orleans	Louisiana	1980
215. University of North Carolina at Charlotte	RD	Doctoral		Charlotte	North Carolina	1983
216. University of North Dakota	RD	Doctoral		Grand Forks	North Dakota	1936
217. University of North Florida	RD	Doctoral		Jacksonville	Florida	2001
218. University of Notre Dame	RD	Doctoral		Notre Dame	Indiana	1942
219. University of Oklahoma-Norman Campus	RD	Doctoral		Norman	Oklahoma	1936
220. University of Pittsburgh-Johnstown	PUI	Baccalaureate		Johnstown	Pennsylvania	2018
221. University of Pittsburgh-Pittsburgh Campus	RD	Doctoral		Pittsburgh	Pennsylvania	1936
222. University of Portland	PUI	Master's		Portland	Oregon	1980
223. University of Puerto Rico-Mayaguez	RD	Master's	Land Grant, HSI	Mayaguez	Puerto Rico	1960
224. University of Rhode Island	RD	Doctoral	Land Grant	Kingston	Rhode Island	1936
225. University of South Alabama	RD	Doctoral		Mobile	Alabama	1989
226. University of South Carolina-Columbia	RD	Doctoral		Columbia	South Carolina	1944
227. University of South Florida	RD	Doctoral		Tampa	Florida	1984
228. University of Southern California	RD	Doctoral		Los Angeles	California	1942
229. University of Southern Indiana	PUI	Master's		Evansville	Indiana	2019
230. University of St Thomas	RD	Professional/ Doctoral		Saint Paul	Minnesota	2018
231. University of the District of Columbia	PUI	Master's	Land Grant, HBCU	Washington	District of Columbia	1988
232. University of the Pacific	RD	Professional/ Doctoral		Stockton	California	1971

233. University of Toledo	RD	Doctoral		Toledo	Ohio	1950
234. University of Utah	RD	Doctoral		Salt Lake City	Utah	1936
235. University of Vermont	RD	Doctoral	Land Grant	Burlington	Vermont	1936
236. University of Virginia-Main Campus	RD	Doctoral		Charlottesville	Virginia	1936
237. University of Washington-Seattle Campus	RD	Doctoral		Seattle	Washington	1936
238. University of Wisconsin-Madison	RD	Doctoral	Land Grant	Madison	Wisconsin	1936
239. University of Wisconsin-Milwaukee	RD	Doctoral		Milwaukee	Wisconsin	1969
240. University of Wisconsin-Platteville	PUI	Master's		Platteville	Wisconsin	1968
241. University of Wyoming	RD	Doctoral	Land Grant	Laramie	Wyoming	1941
242. Utah State University	RD	Doctoral	Land Grant	Logan	Utah	1936
243. Utah Valley University	PUI	Master's		Orem	Utah	2019
244. Valparaiso University	PUI	Professional/ Doctoral		Valparaiso	Indiana	1958
245. Vanderbilt University	RD	Doctoral		Nashville	Tennessee	1939
246. Villanova University	RD	Doctoral		Villanova	Pennsylvania	1941
247. Virginia Military Institute	PUI	Baccalaureate	MLTY	Lexington	Virginia	1936
248. Virginia Polytechnic Institute and State University	RD	Doctoral	Land Grant, MLTY	Blacksburg	Virginia	1936
249. Washington State University	RD	Doctoral	Land Grant	Pullman	Washington	1936
250. Wayne State University	RD	Doctoral		Detroit	Michigan	1944
251. Wentworth Institute of Technology	PUI	Master's		Boston	Massachusetts	2013
252. West Texas A & M University	RD	Master's		Canyon	Texas	2013
253. West Virginia University	RD	Doctoral	Land Grant	Morgantown	West Virginia	1936
254. West Virginia University Institute of Technology	PUI	Baccalaureate		Beckley	West Virginia	1968
255. Western Kentucky University	PUI	Professional/ Doctoral		Bowling Green	Kentucky	2003
256. Western Michigan University	RD	Doctoral		Kalamazoo	Michigan	2004
257. Western New England University	RD	Professional/ Doctoral		Springfield	Massachusetts	2015
258. Widener University	RD	Professional/ Doctoral		Chester	Pennsylvania	1988
259. Worcester Polytechnic Institute	RD	Doctoral		Worcester	Massachusetts	1936
260. York College of Pennsylvania	PUI	Master's		York	Pennsylvania	2019
261. Youngstown State University	RD	Master's		Youngstown	Ohio	1959

