INASLA Trustees Report – February
02.16.22

ASLA Special Meeting on STEM Designation (Thursday Feb 3) – *all linked documents attached to this report.*

- Landscape Architecture STEM Overview Guide
- STEM Case Studies
- LAAB Accreditation Standards

Important Dates

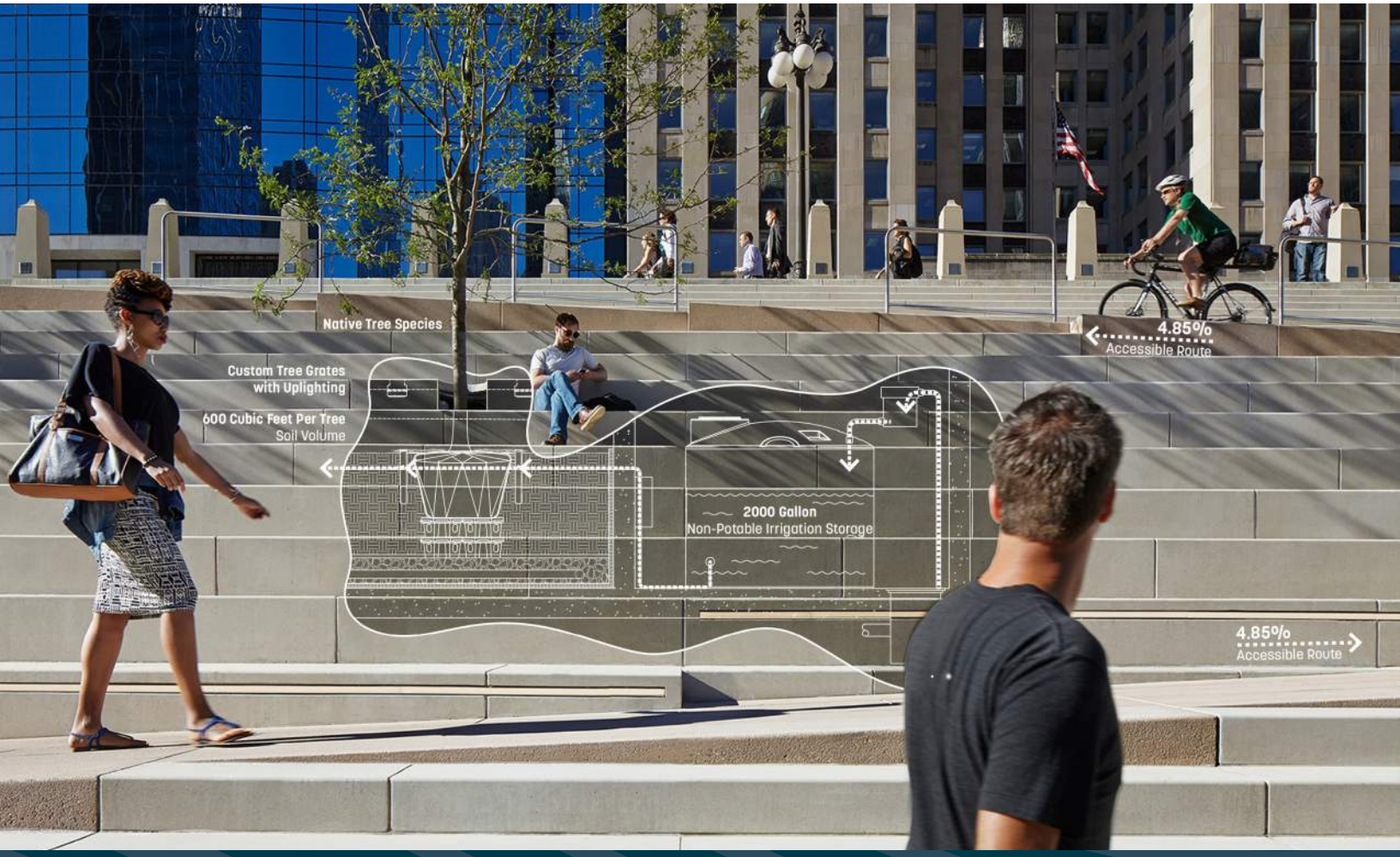
- The ASLA 2022 Conference on Landscape Architecture Call for Presentations is now open. The deadline to submit your proposal is February 22 at 12:00 NOON PT Visit the submission site for detailed information and to review the session submission guides.

Report

- The ASLA Executive Committee held its winter meeting virtually, January 27-28. Agenda items included program, operations, and finance reports as well as generative discussions relating to the strategic plan. The group also received a report from the Landscape Architecture Foundation on its programs and scholarships.
- ASLA announced last week that it has secured strategic partnerships with Land8 Media and the LABASH Conference. The partnerships will expand the audience for landscape architects and landscape architecture. The Communications & Marketing team refined communications to key ASLA constituencies via email messages; drafted and issued press releases; and developed a social media campaign regarding the new partnership.
- **Library of Congress Partnership** – The Library of Congress will now archive the society's Professional Award-winning projects. It's the first time that collections representing the international landscape architecture profession will be archived by a U.S. federal institution. ASLA collaborated with the Library of Congress to draft and issue a joint press release announcing the Library's archiving of ASLA Professional Award winning projects, starting in 2022.
- The ASLA Fund giving for the end-of-year campaign raised over $22,000 for the Women of Color Licensure Advancement Program and over $5,000 in general donations.
- As of Friday, January 14, thirty-four states have convened for legislative session. Staff is tracking 125 occupational licensing bills. Occupational licensing legislation will continue to largely focus on mobility barriers to occupations that require a license to practice, including **the one-size-fits-all "universal licensing" bills. However, we optimistically anticipate ARPL's model language amendments** will be amenable to legislative sponsors of these universal licensing bills.

- 3/12 Rate of Change Full Membership The 3/12 rate of change indicates that ASLA's member levels are almost back to pre-COVID 19 levels
- Student Affiliate ASLA members totaled 360, Student ASLA members, 2,584, and Student International ASLA members, 497, for a grand total of 3,441 Students Members.

American Society of
Landscape Architects



Landscape Architecture Is a STEM Discipline

2018 ASLA Professional General Design Honor Award.
Chicago Riverwalk | State Street to Franklin Street.
Sasaki and Ross Barney Architects.
(Image credit: Kate Joyce; overlay courtesy of Sasaki)

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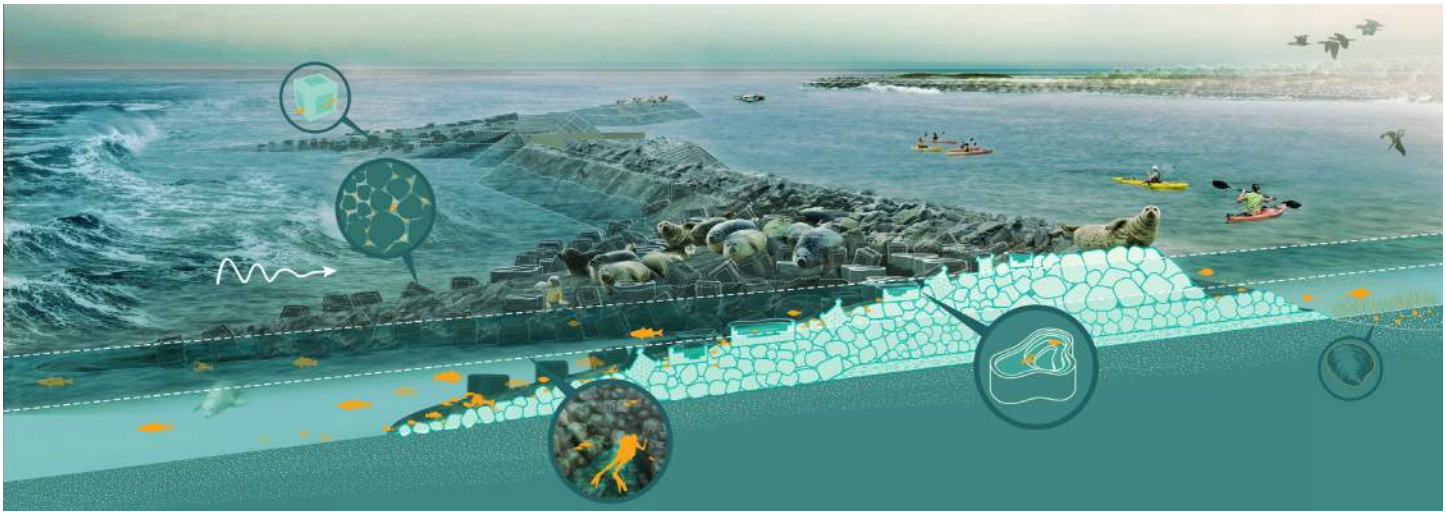


Landscape architects apply their in depth knowledge of natural sciences, hydrodynamic modeling, and coastal systems engineering to plan and design reef barriers that protect against wave damage and erosion and create new wildlife habitat.

Image credit: Living Breakwater, Staten Island, NY.
SCAPE Landscape Architecture

Executive Summary

Landscape architecture is inherently a science, technology, engineering, and mathematics (STEM) discipline. As stewards of the natural and built environment, landscape architects are educated in and routinely apply the physical and natural sciences, technology, engineering, and mathematics in the planning and design of sites where millions of people live, work, and play.

Increased emphasis in recent years on the impacts of natural and built landscapes on the planet's climate and human health and well-being has underscored the need for landscape architecture professionals to be educated and trained in the natural, physical, and human sciences. The landscape architecture profession has responded to this need by intensifying efforts to center landscape architecture education and licensure around STEM disciplines, from hydrology and botany to engineering and sustainability studies. In addition, the increasing number of federal and state government bodies defining landscape architecture as a STEM profession demonstrates the growing awareness that the sciences play a primary role in preparing landscape architects to address some of the planet's most challenging problems.

While the evidence is clear that landscape architecture is undoubtedly a STEM discipline and profession, there are some organizations and government entities that still do not officially recognize this, including the Department of Homeland Security's Student Exchange Visitor Program. The American Society of Landscape Architects (ASLA) and its 15,000 members are working to ensure that landscape architecture is rightfully recognized and designated as a STEM discipline and profession by a myriad of governmental bodies and STEM-focused organizations.

This white paper reviews the evidence that demonstrates that landscape architecture sits firmly within the category of STEM disciplines. It reviews the current state of landscape architecture education and licensure with respect

to STEM disciplines and compares landscape architecture education to the educational content of other fields that are widely considered to be STEM disciplines. In addition, this paper reviews the numerous governmental agencies at the federal and state level that already define landscape architecture as a STEM discipline.

As a field rooted in the natural, physical, and human sciences, landscape architecture education prepares future practitioners to use science, technology, engineering, and mathematics to develop innovative planning and design solutions to challenges in the built and natural environments.

Although there currently is no single, uniform definition on what constitutes a "STEM discipline," the interagency Standard Occupational Classification (SOC) Policy Committee recommended in 2012 that landscape architecture be included in the scope of STEM occupations under an Architecture Occupations subgroup. The Office of Management and Budget approved the Policy Committee's recommendations in 2017. Further, several states formally define landscape architecture as a STEM discipline.

In addition, landscape architecture is defined by a number of federal programs and agencies in ways that highlight the connections between the discipline to the sciences, including the widely used Classification of Instructional Programs (CIP), which defines landscape architecture (CIP code 04.0601) as a program that "[i]ncludes instruction in geology and hydrology; soils, groundcovers, and horticultural elements. . . ."

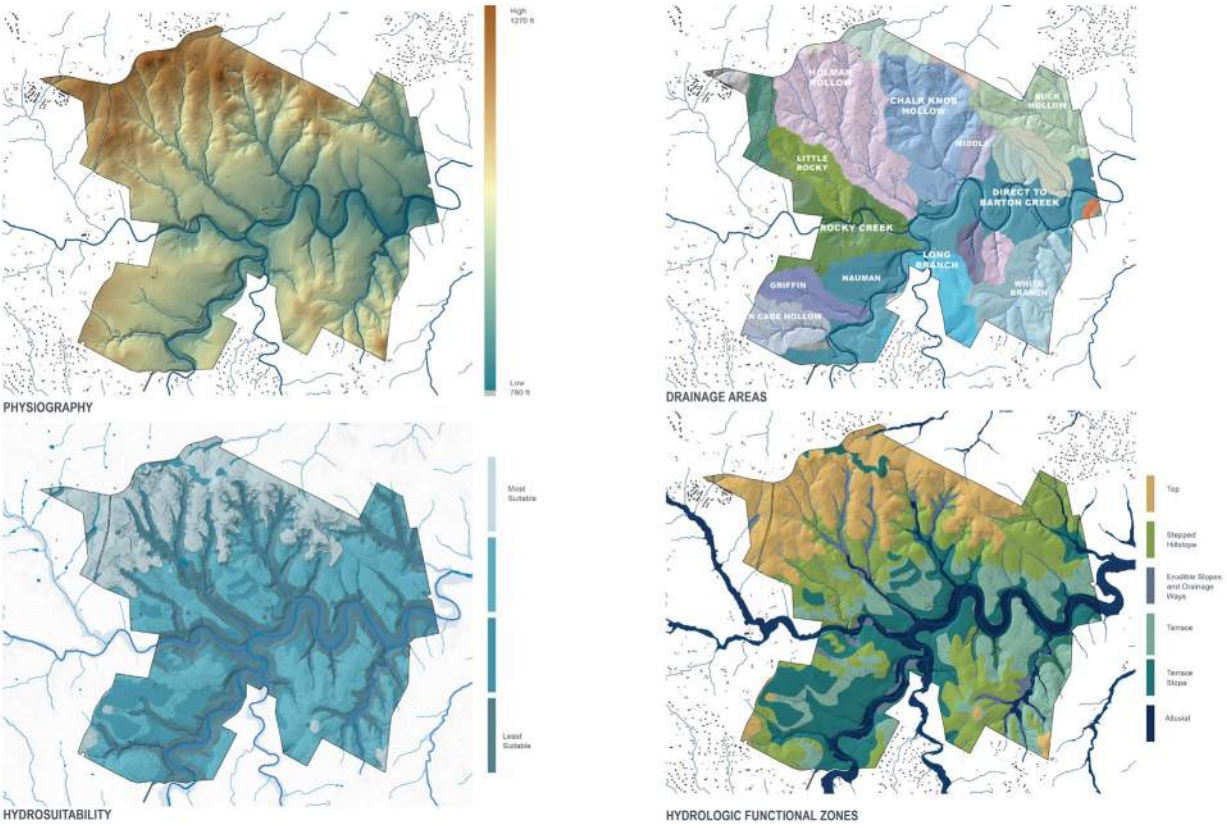
Landscape architects are educated, trained, and tested on a set of knowledge, skills, and abilities that are undoubtedly within STEM disciplines. The Landscape Architectural Accreditation Board (LAAB) specifies standards for accreditation for programs offering professional degrees in landscape architecture, including bachelor or master of landscape architecture (BLA or MLA). LAAB requires academic programs in landscape architecture to provide curricular content in nine professional areas, many of which are in disciplines broadly recognized as STEM.

The technical complexity of landscape architecture and its impact on public health, safety, and welfare have led all 50 states and the District of Columbia to require practitioners to be licensed. Landscape architects must pass a national registration exam, the Landscape Architecture Registration Exam (LARE), before they can be licensed by the state boards of registration.

The LARE is a four-part, fully computerized examination designed to determine whether applicants for landscape architectural licensure possess sufficient knowledge, skills, and abilities to provide landscape architectural services without endangering the health, safety, and welfare of the public. Two of the four

sections of the LARE—1) Inventory and Analysis, and 2) Grading and Drainage, and Construction Documentation—focus almost exclusively on scientific, engineering, technological, and mathematical knowledge.

Landscape architecture degree programs across the country include as much or more STEM content as degree programs for a number of related disciplines commonly considered to be STEM. A 2019 analysis of two such programs—environmental studies (CIP code 3.0103) and sustainability studies (CIP code 30.3301)—in comparison with a landscape architecture program reveals that the landscape architecture program has higher overall STEM content than those on the Department of Homeland Security (DHS)-approved list.



Introduction: Landscape Architecture and STEM

Landscape architecture is a discipline that requires education in and the application of science, technology, engineering, and mathematics (STEM) as part of its academic foundation and its professional practice.

As a field rooted in the natural, physical, and human sciences, landscape architecture education prepares future practitioners to use science, technology, engineering, and mathematics to develop innovative solutions to design challenges in the built and natural environments. Because each landscape architecture project is unique, developing site-specific solutions that rely on the natural, physical, and human sciences is fundamental to the education, training, and practice of landscape architecture.

Landscape architects map hydro-geologically-sensitive landscape factors in GIS, including floodplains, slopes, risers, geological formation boundaries, and soils, in order to create sustainable water management zones as part of a new masterplan.

Image credit: 2018 ASLA Professional Analysis and Planning Honor Award. From Pixels to Stewardship: Advancing Conservation Through Digital Innovation. Andropogon Associates.

Landscape architects continue to spearhead the innovative application of the physical and human sciences toward solving problems of nature-human interactions. The profession applies technology in cutting-edge materials and processes to improve the efficiency, functionality, and health of our natural and built environments. Landscape architects engage in engineering-based design processes to protect the health, safety, and welfare of the public, and to create lasting value in the built environment. Finally, landscape architecture's practical application of mathematics is inherent in the day-to-day practice of the profession, occurring as part of the calculations in everything from construction cost estimates to the complex biochemical reactions of pollutant removal.

In addition to leading planning and design projects, landscape architects are also critical members of interdisciplinary teams that have been assembled to address specific design or research challenges. This is due to landscape architects' grasp of the scientific implications of the function and value of natural systems, along with their ability—honed through education and training—to create innovative design solutions.

1. Definitions of STEM

1.1 Lack of a Uniform STEM Definition

There currently does not exist a single, uniform definition on what constitutes a "STEM discipline." As the Congressional Research Service (CRS) notes:

> Whether it is visas for foreign workers, scholarships for STEM majors, or funding for scientific research, the question of what is meant by the term STEM is central to the federal policy conversation. Some federal agencies, such as the National Science Foundation (NSF), generally use a broader definition of STEM that includes psychology and the social sciences (e.g., political science, economics) as well as the physical and life sciences and engineering (e.g., physics, chemistry, biology, mathematics). Others, including the Department of Homeland Security (DHS) and the U.S. Immigration and Customs Enforcement (ICE), use a narrower definition that generally excludes most (but not all) social sciences and focuses on mathematics, chemistry, physics, computer and information sciences, and engineering. . . . However, some analysts argue that field-specific definitions are too static and that definitions of STEM should focus on "an assemblage of practices and processes that transcend disciplinary lines and from which knowledge and learning of a particular kind emerges." The lack of a common definition for STEM has contributed to confusion, and even contradictory findings, in federal agency, academic, and nonprofit research on the condition of the U.S. STEM workforce and labor supply.[1]

1. Science, Technology, Engineering, and Mathematics (STEM) Education: An Overview

1.2 Standard Occupational Classification

Managed by the Bureau of Labor Statistics (BLS), the Standard Occupational Classification (SOC) system is a federal statistical standard used by a number of federal agencies[2] to classify workers into occupational categories "for the purpose of collecting, calculating, or disseminating data."[3]

The interagency SOC Policy Committee addressed the lack of clarity around a definition of STEM in 2012, noting that "[t]he acronym 'STEM' is widely used in discussions across government, academia, and business, given increased emphasis on innovation and its implications for the economy and labor market. The discussion and analyses quickly get confounded since there is no commonly agreed upon definition of STEM."[4]

As a result of the confusion, the U.S. Office of Management and Budget (OMB) asked the SOC Policy Committee (SOCPC) in 2011 to make recommendations for defining STEM occupations "in order to enhance comparability of data across statistical agencies and organizations studying the STEM workforce for policymaking purposes, including educational and workforce planners."[5]

In 2012, SOCPC disseminated recommendations for defining STEM occupations. According to CRS, "The SOC Policy Committee recommended that STEM occupations fall into two domains: (1) Science, Engineering, Mathematics, and Information Technology, and (2) Science- and Engineering-Related."[6]

In addition, within the domains the Committee identified five types of STEM occupations:

A. Research, Development, Design, or Practitioner Occupations
B. Technologist and Technician Occupations
C. Postsecondary Teaching Occupations
D. Managerial Occupations
E. Sales Occupations

Within the Science and Engineering-Related Domain, the Committee recommended two subgroups, Architecture Occupations and Health Occupations. Under Architecture Occupations, the Committee identified landscape architecture (SOC 17-1012) as a STEM occupation as a "Research, Development, Design, or Practitioner Occupation."[7]

The 2012 recommendations were included in the 2018 SOC update, published by the Office of Management and Budget (OMB) on November 28, 2017.[8]
(See Appendix A)

2. Other federal agencies and programs that use the SOC include the Department of Commerce (Census Bureau), Department of Defense, Department of Education, Department of Labor (Employment and Training Administration (ETA)), Equal Employment Opportunity Commission, and the National Science Foundation. (https://www.bls.gov/soc/socimp.htm).

3. https://www.bls.gov/soc/home.htm

4. Microsoft Word - Attachment_A_STEM.docx (bls.gov)

5. Ibid.

6. Science, Technology, Engineering, and Mathematics (STEM) Education: An Overview

7. Attachment_C_ STEM.xls (bls.gov)

8. Attachment_C_2018 (bls.gov)

Landscape architects use their knowledge of natural and material sciences to design innovative environmental solutions, such as structured floating wetlands that clean water and restore wildlife habitat.

Image credit: 2018 ASLA Professional Research Honor Award.
Urban Aquatic Health: Integrating New Technologies and Resiliency into Floating Wetlands. Ayers Saint Gross.

2. Landscape Architecture Definitions and Scope

Landscape architecture encompasses the analysis, planning, design, management, and stewardship of the natural and built environment.

2.1 American Society of Landscape Architects Definition of Landscape Architecture

Landscape architects plan and design the spaces outside buildings and structures, as well as spaces on rooftops and over structures, including community master plans, multimodal transportation networks, transit-oriented development, park and outdoor recreation spaces, water and stormwater management infrastructure, streetscapes, and more. Furthermore, as the impacts of climate change intensify, landscape architects are leading efforts to conserve water, protect food sources, prevent surface water and groundwater pollution, mitigate storm surge flooding and sea-level rise, protect against and manage wildfires, and more.

The American Society of Landscape Architects (ASLA) defines landscape architecture as "any service where landscape architectural education, training, experience, and the application of mathematical, physical, social, and natural science principles are applied."[9]

9. https://www.asla.org/uploadedFiles/CMS/Advocate/Public_Policies/Public/Licensure_Definition_of_Practice.pdf

2.2 Federal Government Definitions of Landscape Architecture:

Several federal agencies and programs define landscape architecture in ways that highlight the connections of the discipline to the sciences.

2.2.a Classification of Instructional Programs (CIP)

The Classification of Instructional Programs (CIP) "provides a taxonomic scheme that supports the accurate tracking and reporting of fields of study and program completions activity. CIP was originally developed by the U.S. Department of Education's National Center for Education Statistics (NCES) in 1980, with revisions occurring in 1985, 1990, 2000, 2010 and 2020."[10]

The 2020 update of the CIP defines landscape architecture (CIP code 04.0601) as:

> "A program that prepares individuals for the independent professional practice of landscape architecture and research in various aspects of the field. Includes instruction in geology and hydrology; soils, groundcovers, and horticultural elements; project and site planning; landscape design, history, and theory; environmental design; applicable law and regulations; and professional responsibilities and standards."[11]

2.2.b Department of Defense

The U.S. Department of Defense's (DoD) Unified Facilities Criteria (UFC) provides planning, design, construction, sustainment, restoration, and modernization criteria for military departments, defense agencies, and for DoD Field Activities. UFC are used on all DoD projects and work for other customers where appropriate.[12]

The UFC defines landscape architecture as a field that:

> "combines ecology, hydrology, engineering, planning, and functional design to create successful DoD facilities that achieve the following goals:
>
> - Protect the health, safety, and welfare of all users.
> - Elevate Installation functionality and appearance to enhance the quality of life.
> - Establish a sense of place and unique identity.
> - Preserve cultural and historic landscapes.
> - Provide spaces considering 'human factors.'
> - Achieve environmentally sustainable development and operations.
> - Protect natural communities of plants and wildlife.
> - Meet DoD requirements for outdoor water use and management.
> - Utilize operation and maintenance plans to ensure successful long-term viability of landscapes."[13]

10. CIP user site (ed.gov)
11. CIP user site (ed.gov)
12. UNIFIED FACILITIES CRITERIA (UFC) DoD MINIMUM ANTITERRORISM STANDARDS FOR BUILDINGS - UNT Digital Library
13. UFC 3-201-02 Landscape Architecture, with Change 1 (wbdg.org)

2.3 State Government Definitions of Landscape Architecture

While each state has its own definition of landscape architecture, most are similar in nature to that of the Commonwealth of Virginia:

> "Landscape architect" means a person who, by reason of his special knowledge of natural, physical, and mathematical sciences, and the principles and methodology of landscape architecture and landscape architectural design acquired by professional education, practical experience, or both, is qualified to engage in the practice of landscape architecture and whose competence has been attested by the Board through licensure as a landscape architect."[14]

As noted above, landscape architecture is defined in federal guidelines and state licensure legislation as a profession whose practitioners require extensive education in—and routinely practice—the physical and natural sciences in the pursuit of innovative design solutions to shape the natural and built environments.

14. § 54.1-400. Definitions (virginia.gov)

Landscape architects are also educators who teach undergraduate and graduate students with the latest technologies, such as this dynamic modeling and geo-morphological table that helps students understand how vegetation and creek structures affect flood control.

Image credit: 2019 ASLA Professional Analysis and Planning Honor Award. Public Sediment for Alameda. SCAPE Landscape Architecture.

3. Landscape Architecture Education and Licensure

In order to practice the profession, landscape architects are educated, trained, and tested on a set of knowledge, skills, and abilities that sit firmly within STEM disciplines, including:

- site design
- land planning
- grading
- drainage
- stormwater management
- horticulture

- environmental sciences
- site suitability
- erosion control
- hydrology
- irrigation
- vehicular and pedestrian circulation
- roadway alignment design
- manipulation of contours and spot elevations
- calculations of slopes, grades, and volumes of material
- design of surface and subsurface storm drainage, including hydraulic characteristics and storm drain connections
- site planning for buildings and other structures; and
- the research of innovative design solutions.

3.1 Landscape Architecture Education Requirements and STEM

Landscape architects are educated, trained, and tested on numerous STEM disciplines that comprise the core of the landscape architecture education.

In the United States, the Landscape Architectural Accreditation Board (LAAB) specifies standards for the accreditation for programs offering professional degrees in landscape architecture, including bachelor or master of landscape architecture (BLA or MLA).

The Landscape Architectural Accreditation Board (LAAB) is recognized by the Council for Higher Education Accreditation as the accrediting agency for first-professional baccalaureate and master's degree programs in landscape architecture in the United States. Currently, LAAB accredits at least one program at 73 institutions in the United States. There are 53 accredited MLA programs and 47 accredited undergraduate programs. In addition to the accredited programs, one MLA program has achieved candidacy status. A program that has candidacy status has made a commitment to apply for initial accreditation within twelve months of its first graduating class.

LAAB requires academic programs in landscape architecture to provide curricular content in nine professional areas, many of which are in disciplines broadly recognized as STEM. These include:

1. Systems and processes—natural and cultural (related to design, planning, and management)
- plants and ecosystems sciences
- built environment and infrastructure
- human factors and social and community systems
- human health and well-being

2. Assessment and evaluation
- site assessment
- pre-design analysis
- landscape performance
- post-occupancy evaluation
- visual and scenic assessment

3. History, theory, philosophy, principles, and values
- sustainability, resiliency, stewardship
- health, safety, welfare
- numeracy, quantitative problem-solving, and communication
- site materials
- use and management of plants and vegetation

4. Computer applications and advanced technologies
- visualization and modeling
- communication (conceptual and construction drawings)
- geospatial analysis

5. Research and scholarly methods (for master's-level degree programs)
- quantitative and qualitative methods
- establishing a research hypothesis
- framing research questions
- literature/case study review/precedent review
- research integrity and protection of human subjects
- communication of research

3.1.a Typical Landscape Architecture Curricula

Although each landscape architecture program is somewhat different, every LAAB-accredited program must meet the requirements above.

As such, landscape architecture students are required to take courses in numerous STEM disciplines. A 2021 survey of U.S. landscape architecture schools conducted by ASLA found that bachelor's and master's degree programs in landscape architecture contain numerous courses with significant STEM content:

Average Number of Required Courses with STEM Content in U.S. Landscape Architecture BLA/MLA Programs[15]

	BLA	MLA
Botany/Horticulture	4.2	2.6
Construction Materials/Methods	4.2	2.8
Ecology	4.7	3.8

15. ASLA, Survey of Landscape Architecture BLA/MLA Programs, 2021

	BLA	MLA
Engineering	2.8	2.5
Geology	2.7	0.8
Hydrology	3.0	1.6
Mathematics	2.3	1.1
Stormwater Management/Drainage	3.3	1.9
Sustainability Studies	5.7	4.4
Vehicular/Pedestrian Circulation/Roadway Alignment/Design	3.3	2.1

(See Appendix C for detailed information from schools that responded to the ASLA survey.)

3.2 Landscape Architects' Professional Licensure Requirements and STEM

Landscape architects are charged to ensure the health, safety, and welfare of the users of all their works. The technical complexity of landscape architecture and its impact on public health, safety, and welfare have led all 50 states and the District of Columbia to require practitioners to be licensed. In addition to meeting education and experience requirements, candidates for landscape architecture licensure must pass a national registration exam—the Landscape Architecture Registration Exam (LARE)—before they can be licensed by the state boards of registration.

The Landscape Architect Registration Examination (LARE) is a four-part, fully computerized examination designed to determine whether applicants for landscape architectural licensure possess sufficient knowledge, skills, and abilities to provide landscape architectural services without endangering the health, safety, and welfare of the public. The LARE is prepared and scored by the Council of Landscape Architecture Registration Boards (CLARB) in accordance with all current standards for fairness and quality of licensure exams. All sections of the LARE are administered by CLARB, and all candidates register for the exam on the CLARB website. While the requirements to sit for the exam vary by jurisdiction, the exam, its administration dates and procedures, and its standards for passing the exam are the same in every jurisdiction.

The content of the LARE is based on the results of a scientific "job analysis" survey conducted every five to seven years. The most recent survey was administered in early 2016 and included the participation of more than 5548 practicing landscape architects from the United States and Canada. The survey results were analyzed by a group of subject matter experts, comprised of licensed landscape architects from diverse areas of practice and locations across the continent. Survey respondents were asked to rate all job tasks on three separate scales: how frequently the tasks were performed, how important the tasks were to successful

performance of the job, and whether successful performance of each task was required at initial licensure.[16]

Section 1 — Project and Construction Management
Section 2 — Inventory and Analysis
Section 3 — Design
Section 4 — Grading, Drainage, and Construction Documentation[17]

In particular, Sections 2 and 4 of the LARE focus on scientific, engineering, technological, and mathematical knowledge:[18]

Section 2: Inventory and Analysis

Tests a candidate's knowledge of inventory, data gathering and analysis techniques, and the conceptual decision-making process that occurs before site planning. Topics include site suitability, functional relationships, land use planning, principles of design, and stormwater management. An analysis of existing conditions may include site use, circulation, utility, microclimate, floodplain conditions, soil, slope, solar, surface hydrology, and other factors.

Knowledge, Skills and Abilities (KSA) tested in Section 2 include:

- Perform Circulation Analysis
- Interpret Utility Analysis
- Perform Micro and Macro Climate Analysis
- Perform Hydrological Analysis
- Perform Vegetation Analysis
- Interpret Ecological Analysis
- Perform Topographical Analysis
- Interpret Soil and Geotechnical/Geological Analysis
- Interpret Environmental Studies
- Interpret Economic Analysis

Section 4 - Grading, Drainage, and Construction Documentation

Tests KSAs required to manipulate the surface of the land and constructed features to meet design objectives and to direct surface and subsurface water. The grading portions of the section require examinees to manipulate contours and spot elevations, calculate slopes, grades, and volumes of material, facilitate the removal of stormwater, and change the elevations of the existing landscape to accommodate buildings, structures, and vehicular and pedestrian circulation systems. The drainage portions of the section test the ability to design surface and subsurface storm drainage systems, including hydraulic characteristics and storm drain connections, to effectively and safely manage stormwater.

16. Take the Exam FAQs (clarb.org)

17. Landscape Architect Registration Examination (clarb.org)

18. See Appendix B for full listing of LARE content.

KSAs tested in Section 4 include:

- Prepare Soil Boring Location Plan
- Develop Stormwater Pollution Prevention Plan
- Develop Site Protection Plan
- Develop Mitigation Plan
- Develop Grading and Drainage Plan
- Develop Planting Practices, Plans, Notes and Schedules
- Develop Materials Plan
- Prepare Site Infrastructure Plan
- Develop Irrigation Plan
- Prepare Lighting Plan
- Prepare Stormwater Management Plan

4. Comparing Landscape Architecture to Currently Recognized STEM Disciplines

Landscape architects apply in depth knowledge of math, engineering, and technology, along with soil, material, and natural sciences, to ensure landscapes manage water safely and sustainably.

Image credit: 2020 ASLA Professional General Design Honor Award. Designing, Implementing, and Managing Improvements to the National Mall. HOK.

The Department of Homeland Security (DHS) is currently reviewing a recommendation from ASLA to include landscape architecture on the STEM Designated Degree Program list. Numerous allied disciplines already are found on the DHS-approved list, including environmental studies, environmental science, plant science, urban forestry, natural resources conservation, engineering, and others.

In fact, landscape architecture degree programs across the country include as much or more STEM content as degree programs for many of these currently recognized disciplines.

A 2019 analysis of two such programs—environmental studies (CIP code 3.0103) and sustainability studies (CIP code 30.3301)—in comparison with a highly ranked landscape architecture program reveals that the landscape architecture program has higher overall STEM content than those on the DHS-approved list.

The study compared the Master of Landscape Architecture (MLA) Program at Harvard University with the Master of Environmental Studies (MES) Program at the University of Pennsylvania and the Master of Sustainability (MAS) Program at Arizona State University, finding higher overall STEM content in the required course material of the landscape architecture program. (See Table 1)

A review of the curriculum structure for each program, including a class-by-class analysis of STEM content, was used to designate each class—whether a required course or an optional course/elective—as being either "STEM-focused," including "some STEM content," or including "little to no STEM content." This analysis clearly demonstrates the breadth of STEM content for the landscape architecture program in comparison to other STEM-designated programs.

STEM Graduate Curriculum Comparison[19]

	Required STEM-focused courses	Required courses with some STEM content	Optional courses that may include STEM content	Required or optional courses with little or no STEM content
MLA - Harvard	13%	47%	33%	7%
MES – UPenn	8%	17%	75%	-
MAS – ASU	-	16%	49%	35%

19. Barth, Brian. Landscape Architecture STEM Graduate Curriculum Comparison [unpublished research]. 2019.

5. Current Governmental Landscape Architecture STEM Designations

5.1 Federal Designations of Landscape Architecture as STEM

As noted earlier, the Bureau of Labor Statistics Standard Occupational Classification (SOC) System has recognized—and OMB has approved—landscape architecture as a science and engineering related domain since 2012.

Specifically, landscape architecture is listed under 17-0000 Architecture and Engineering Occupations. This system is used by the federal government to classify workers into occupational categories. Detailed occupations in the SOC

with similar job duties, and in some cases, skills, education, and/or training, are grouped together. Under this system, landscape architecture is grouped with civil engineers, architectural and civil drafters, environmental engineers, and surveyors, all of which are included on the DHS STEM Designated Degree Program List.

5.2 State Designations of Landscape Architecture as STEM:

While not all states have developed their own lists of STEM disciplines, there are at least three states that formally define landscape architecture as a STEM discipline. The Departments of Labor in both New York[20] and Connecticut[21] recognize landscape architecture as a STEM profession. Additionally, the state of Florida recognizes landscape architecture as a STEM degree program through the Board of Governors' State University System's list of "Programs of Strategic Emphasis." The fundamental purpose of the "Programs of Strategic Emphasis" is to promote the alignment of the State University System's degree program offerings with the state's economic and workforce needs.[22]

20. stem-occupations-in-new-york-state.pdf (ny.gov)

21. Connecticut Careers in Science, Technology, Engineering, and Mathematics - STEM (state.ct.us)

22. Current-PSE-list-approved-by-the-BOG-at-its-September-2020-meeting-PDF.pdf (flbog.edu)

Landscape architects plan and design landscapes that provide research opportunities on water management through green infrastructure solutions.

Image credit: 2020 ASLA Professional Research Honor Award.
Weather-Smithing: Assessing the role of vegetation, soil, and adaptive management in urban green infrastructure performance. Andropogon Associates.

Conclusion

Increased emphasis in recent years on the impacts of natural and built landscapes on the planet's climate and human health and well-being has underscored the need for landscape architecture professionals educated and trained in the natural, physical, and human sciences to solve increasingly complex planning and design problems. Efforts to conserve water, prevent water pollution, mitigate flooding, protect and preserve ecosystems, and protect the health and safety of

the public are central to the practice of landscape architecture, and all require extensive education and training in the sciences, technology, engineering, and mathematics.

The landscape architecture profession has responded to this need by intensifying efforts to center landscape architecture education around STEM disciplines, from hydrology and botany to engineering and sustainability studies. Likewise, the landscape architecture licensure examination required by all 50 states and the District of Columbia demands extensive knowledge of STEM subjects from those who take it. In fact, as ASLA's review of landscape architecture and similar post-secondary programs indicates, landscape architecture education contains as much if not more STEM content than several disciplines that are currently defined as STEM.

In addition, the increasing number of federal and state government bodies defining landscape architecture as a STEM profession demonstrates the primary role that the sciences play in preparing landscape architects to innovatively address some of the nation's most complex and challenging problems.

The principles of STEM constitute the foundation of the academic criteria and professional practice of landscape architecture. Through advocacy, communication, and research, ASLA will continue to raise the visibility of the profession's innate STEM qualities and practice areas with federal, state, and local stakeholders, the STEM community, and the general public.

Appendices

Appendix A

Bureau of Labor Statistics SOC (Standard Occupational Classification) Policy Committee, June 2019, https://www.bls.gov/soc/Attachment_C_STEM_2018.pdf

Appendix B

LARE Orientation: Understanding the Landscape Architect Registration Examination, Council of Landscape Architectural Registration Boards (CLARB), October 2020
https://www.clarb.org/docs/default-source/take-the-exam/lareorientationguide.pdf?sfvrsn=4

Appendix C

ASLA Survey of Landscape Architecture Schools, May 2021. Charts assembled by Agora Consulting, June 2021

Appendix A

Bureau of Labor Statistics SOC (Standard Occupational Classification) Policy Committee

Key	Sub-domain	
	1	Life and Physical Science, Engineering, Mathematics, and Information Technology Occupations
	2	Social Science Occupations
	3	Architecture Occupations
	4	Health Occupations
		Split across 2 sub-domains or type of occupation

	Types of occupations	
	A	Research, Development, Design, or Practitioner Occupations
	B	Technologist and Technician Occupations
	C	Postsecondary Teaching Occupations
	D	Managerial Occupations
	E	Sales Occupations

Sub-domain and Type of Occupation	2018 SOC code	2018 SOC code
	11-1011	Chief Executives
	11-1021	General and Operations Managers
	11-1031	Legislators
	11-2011	Advertising and Promotions Managers
	11-2021	Marketing Managers
	11-2022	Sales Managers
	11-2032	Public Relations Managers
	11-2033	Fundraising Managers
	11-3012	Administrative Services Managers
	11-3013	Facilities Managers
1.D	11-3021	Computer and Information Systems Managers
	11-3031	Financial Managers
	11-3051	Industrial Production Managers
	11-3061	Purchasing Managers
	11-3071	Transportation, Storage, and Distribution Managers
	11-3111	Compensation and Benefits Managers
	11-3121	Human Resources Managers
	11-3131	Training and Development Managers
	11-9013	Farmers, Ranchers, and Other Agricultural Managers
	11-9021	Construction Managers
	11-9031	Education and Childcare Administrators, Preschool and Daycare
	11-9032	Education Administrators, Kindergarten through Secondary
	11-9033	Education Administrators, Postsecondary
	11-9039	Education Administrators, All Other
1.D and 3.D	11-9041	Architectural and Engineering Managers
	11-9051	Food Service Managers
	11-9071	Gambling Managers
	11-9072	Entertainment and Recreation Managers, Except Gambling
	11-9081	Lodging Managers
4.D	11-9111	Medical and Health Services Managers
1.D	11-9121	Natural Sciences Managers
	11-9131	Postmasters and Mail Superintendents
	11-9141	Property, Real Estate, and Community Association Managers
	11-9151	Social and Community Service Managers
	11-9161	Emergency Management Directors
	11-9171	Funeral Home Managers
	11-9179	Personal Service Managers, All Other
	11-9199	Managers, All Other

	13-1011	Agents and Business Managers of Artists, Performers, and Athletes
	13-1021	Buyers and Purchasing Agents, Farm Products
	13-1022	Wholesale and Retail Buyers, Except Farm Products
	13-1023	Purchasing Agents, Except Wholesale, Retail, and Farm Products
	13-1031	Claims Adjusters, Examiners, and Investigators
	13-1032	Insurance Appraisers, Auto Damage
	13-1041	Compliance Officers
	13-1051	Cost Estimators
	13-1071	Human Resources Specialists
	13-1074	Farm Labor Contractors
	13-1075	Labor Relations Specialists
	13-1081	Logisticians
	13-1082	Project Management Specialists
	13-1111	Management Analysts
	13-1121	Meeting, Convention, and Event Planners
	13-1131	Fundraisers
	13-1141	Compensation, Benefits, and Job Analysis Specialists
	13-1151	Training and Development Specialists
	13-1161	Market Research Analysts and Marketing Specialists
	13-1199	Business Operations Specialists, All Other
	13-2011	Accountants and Auditors
	13-2022	Appraisers of Personal and Business Property
	13-2023	Appraisers and Assessors of Real Estate
	13-2031	Budget Analysts
	13-2041	Credit Analysts
	13-2051	Financial and Investment Analysts
	13-2052	Personal Financial Advisors
	13-2053	Insurance Underwriters
	13-2054	Financial Risk Specialists
	13-2061	Financial Examiners
	13-2071	Credit Counselors
	13-2072	Loan Officers
	13-2081	Tax Examiners and Collectors, and Revenue Agents
	13-2082	Tax Preparers
	13-2099	Financial Specialists, All Other
1.A	15-1211	Computer Systems Analysts
1.A	15-1212	Information Security Analysts
1.A	15-1221	Computer and Information Research Scientists
1.B	15-1231	Computer Network Support Specialists
1.B	15-1232	Computer User Support Specialists
1.A	15-1241	Computer Network Architects
1.A	15-1242	Database Administrators
1.A	15-1243	Database Architects
1.A	15-1244	Network and Computer Systems Administrators
1.A	15-1251	Computer Programmers
1.A	15-1252	Software Developers
1.A	15-1253	Software Quality Assurance Analysts and Testers
1.A	15-1254	Web Developers
1.A	15-1255	Web and Digital Interface Designers
1.A and 1.B	15-1299	Computer Occupations, All Other
1.A	15-2011	Actuaries
1.A	15-2021	Mathematicians
1.A	15-2031	Operations Research Analysts
1.A	15-2041	Statisticians
1.A	15-2051	Data Scientists
1.A and 1.B	15-2099	Mathematical Science Occupations, All Other

3.A	17-1011	Architects, Except Landscape and Naval
3.A	17-1012	Landscape Architects
1.B	17-1021	Cartographers and Photogrammetrists
1.B	17-1022	Surveyors
1.A	17-2011	Aerospace Engineers
1.A	17-2021	Agricultural Engineers
1.A	17-2031	Bioengineers and Biomedical Engineers
1.A	17-2041	Chemical Engineers
1.A	17-2051	Civil Engineers
1.A	17-2061	Computer Hardware Engineers
1.A	17-2071	Electrical Engineers
1.A	17-2072	Electronics Engineers, Except Computer
1.A	17-2081	Environmental Engineers
1.A	17-2111	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors
1.A	17-2112	Industrial Engineers
1.A	17-2121	Marine Engineers and Naval Architects
1.A	17-2131	Materials Engineers
1.A	17-2141	Mechanical Engineers
1.A	17-2151	Mining and Geological Engineers, Including Mining Safety Engineers
1.A	17-2161	Nuclear Engineers
1.A	17-2171	Petroleum Engineers
1.A	17-2199	Engineers, All Other
1.B and 3.B	17-3011	Architectural and Civil Drafters
1.B	17-3012	Electrical and Electronics Drafters
1.B	17-3013	Mechanical Drafters
1.B and 3.B	17-3019	Drafters, All Other
1.B	17-3021	Aerospace Engineering and Operations Technologists and Technicians
1.B	17-3022	Civil Engineering Technologists and Technicians
1.B	17-3023	Electrical and Electronic Engineering Technologists and Technicians
1.B	17-3024	Electro-Mechanical and Mechatronics Technologists and Technicians
1.B	17-3025	Environmental Engineering Technologists and Technicians
1.B	17-3026	Industrial Engineering Technologists and Technicians
1.B	17-3027	Mechanical Engineering Technologists and Technicians
1.B	17-3028	Calibration Technologists and Technicians
1.B	17-3029	Engineering Technologists and Technicians, Except Drafters, All Other
1.B	17-3031	Surveying and Mapping Technicians
1.A	19-1011	Animal Scientists
1.A	19-1012	Food Scientists and Technologists
1.A	19-1013	Soil and Plant Scientists
1.A	19-1021	Biochemists and Biophysicists
1.A	19-1022	Microbiologists
1.A	19-1023	Zoologists and Wildlife Biologists
1.A	19-1029	Biological Scientists, All Other
1.A	19-1031	Conservation Scientists
1.A	19-1032	Foresters
1.A	19-1041	Epidemiologists
1.A	19-1042	Medical Scientists, Except Epidemiologists
1.A	19-1099	Life Scientists, All Other
1.A	19-2011	Astronomers
1.A	19-2012	Physicists
1.A	19-2021	Atmospheric and Space Scientists
1.A	19-2031	Chemists
1.A	19-2032	Materials Scientists
1.A	19-2041	Environmental Scientists and Specialists, Including Health
1.A	19-2042	Geoscientists, Except Hydrologists and Geographers
1.A	19-2043	Hydrologists

1.A	19-2099	Physical Scientists, All Other
2.A	19-3011	Economists
2.A	19-3022	Survey Researchers
2.A	19-3032	Industrial-Organizational Psychologists
2.A	19-3033	Clinical and Counseling Psychologists
2.A	19-3034	School Psychologists
2.A	19-3039	Psychologists, All Other
2.A	19-3041	Sociologists
2.A	19-3051	Urban and Regional Planners
2.A	19-3091	Anthropologists and Archeologists
2.A	19-3092	Geographers
	19-3093	Historians
2.A	19-3094	Political Scientists
2.A	19-3099	Social Scientists and Related Workers, All Other
1.B	19-4012	Agricultural Technicians
1.B	19-4013	Food Science Technicians
1.B	19-4021	Biological Technicians
1.B	19-4031	Chemical Technicians
1.B	19-4042	Environmental Science and Protection Technicians, Including Health
1.B	19-4043	Geological Technicians, Except Hydrologic Technicians
1.B	19-4044	Hydrologic Technicians
1.B	19-4051	Nuclear Technicians
2.B	19-4061	Social Science Research Assistants
1.B	19-4071	Forest and Conservation Technicians
1.B	19-4092	Forensic Science Technicians
1.B and 2.B	19-4099	Life, Physical, and Social Science Technicians, All Other
	19-5011	Occupational Health and Safety Specialists
	19-5012	Occupational Health and Safety Technicians
	21-1011	Substance Abuse and Behavioral Disorder Counselors
	21-1012	Educational, Guidance, and Career Counselors and Advisors
	21-1013	Marriage and Family Therapists
	21-1014	Mental Health Counselors
	21-1015	Rehabilitation Counselors
	21-1019	Counselors, All Other
	21-1021	Child, Family, and School Social Workers
	21-1022	Healthcare Social Workers
	21-1023	Mental Health and Substance Abuse Social Workers
	21-1029	Social Workers, All Other
	21-1091	Health Education Specialists
	21-1092	Probation Officers and Correctional Treatment Specialists
	21-1093	Social and Human Service Assistants
	21-1094	Community Health Workers
	21-1099	Community and Social Service Specialists, All Other
	21-2011	Clergy
	21-2021	Directors, Religious Activities and Education
	21-2099	Religious Workers, All Other
	23-1011	Lawyers
	23-1012	Judicial Law Clerks
	23-1021	Administrative Law Judges, Adjudicators, and Hearing Officers
	23-1022	Arbitrators, Mediators, and Conciliators
	23-1023	Judges, Magistrate Judges, and Magistrates
	23-2011	Paralegals and Legal Assistants
	23-2093	Title Examiners, Abstractors, and Searchers
	23-2099	Legal Support Workers, All Other
	25-1011	Business Teachers, Postsecondary
1.C	25-1021	Computer Science Teachers, Postsecondary

1.C	25-1022	Mathematical Science Teachers, Postsecondary
3.C	25-1031	Architecture Teachers, Postsecondary
1.C	25-1032	Engineering Teachers, Postsecondary
1.C	25-1041	Agricultural Sciences Teachers, Postsecondary
1.C	25-1042	Biological Science Teachers, Postsecondary
1.C	25-1043	Forestry and Conservation Science Teachers, Postsecondary
1.C	25-1051	Atmospheric, Earth, Marine, and Space Sciences Teachers, Postsecondary
1.C	25-1052	Chemistry Teachers, Postsecondary
1.C	25-1053	Environmental Science Teachers, Postsecondary
1.C	25-1054	Physics Teachers, Postsecondary
2.C	25-1061	Anthropology and Archeology Teachers, Postsecondary
2.C	25-1062	Area, Ethnic, and Cultural Studies Teachers, Postsecondary
2.C	25-1063	Economics Teachers, Postsecondary
2.C	25-1064	Geography Teachers, Postsecondary
2.C	25-1065	Political Science Teachers, Postsecondary
2.C	25-1066	Psychology Teachers, Postsecondary
2.C	25-1067	Sociology Teachers, Postsecondary
2.C	25-1069	Social Sciences Teachers, Postsecondary, All Other
4.C	25-1071	Health Specialties Teachers, Postsecondary
4.C	25-1072	Nursing Instructors and Teachers, Postsecondary
	25-1081	Education Teachers, Postsecondary
	25-1082	Library Science Teachers, Postsecondary
	25-1111	Criminal Justice and Law Enforcement Teachers, Postsecondary
	25-1112	Law Teachers, Postsecondary
	25-1113	Social Work Teachers, Postsecondary
	25-1121	Art, Drama, and Music Teachers, Postsecondary
	25-1122	Communications Teachers, Postsecondary
	25-1123	English Language and Literature Teachers, Postsecondary
	25-1124	Foreign Language and Literature Teachers, Postsecondary
	25-1125	History Teachers, Postsecondary
	25-1126	Philosophy and Religion Teachers, Postsecondary
	25-1192	Family and Consumer Sciences Teachers, Postsecondary
	25-1193	Recreation and Fitness Studies Teachers, Postsecondary
	25-1194	Career/Technical Education Teachers, Postsecondary
	25-1199	Postsecondary Teachers, All Other
	25-2011	Preschool Teachers, Except Special Education
	25-2012	Kindergarten Teachers, Except Special Education
	25-2021	Elementary School Teachers, Except Special Education
	25-2022	Middle School Teachers, Except Special and Career/Technical Education
	25-2023	Career/Technical Education Teachers, Middle School
	25-2031	Secondary School Teachers, Except Special and Career/Technical Education
	25-2032	Career/Technical Education Teachers, Secondary School
	25-2051	Special Education Teachers, Preschool
	25-2055	Special Education Teachers, Kindergarten
	25-2056	Special Education Teachers, Elementary School
	25-2057	Special Education Teachers, Middle School
	25-2058	Special Education Teachers, Secondary School
	25-2059	Special Education Teachers, All Other
	25-3011	Adult Basic Education, Adult Secondary Education, and English as a Second Language Instructors
	25-3021	Self-Enrichment Teachers
	25-3031	Substitute Teachers, Short-Term
	25-3041	Tutors
	25-3099	Teachers and Instructors, All Other
	25-4011	Archivists
	25-4012	Curators
	25-4013	Museum Technicians and Conservators

	25-4022	Librarians and Media Collections Specialists
	25-4031	Library Technicians
	25-9021	Farm and Home Management Educators
	25-9031	Instructional Coordinators
	25-9042	Teaching Assistants, Preschool, Elementary, Middle, and Secondary School, Except Special Education
	25-9043	Teaching Assistants, Special Education
	25-9044	Teaching Assistants, Postsecondary
	25-9049	Teaching Assistants, All Other
	25-9099	Educational Instruction and Library Workers, All Other
	27-1011	Art Directors
	27-1012	Craft Artists
	27-1013	Fine Artists, Including Painters, Sculptors, and Illustrators
	27-1014	Special Effects Artists and Animators
	27-1019	Artists and Related Workers, All Other
	27-1021	Commercial and Industrial Designers
	27-1022	Fashion Designers
	27-1023	Floral Designers
	27-1024	Graphic Designers
	27-1025	Interior Designers
	27-1026	Merchandise Displayers and Window Trimmers
	27-1027	Set and Exhibit Designers
	27-1029	Designers, All Other
	27-2011	Actors
	27-2012	Producers and Directors
	27-2021	Athletes and Sports Competitors
	27-2022	Coaches and Scouts
	27-2023	Umpires, Referees, and Other Sports Officials
	27-2031	Dancers
	27-2032	Choreographers
	27-2041	Music Directors and Composers
	27-2042	Musicians and Singers
	27-2091	Disc Jockeys, Except Radio
	27-2099	Entertainers and Performers, Sports and Related Workers, All Other
	27-3011	Broadcast Announcers and Radio Disc Jockeys
	27-3023	News Analysts, Reporters, and Journalists
	27-3031	Public Relations Specialists
	27-3041	Editors
	27-3042	Technical Writers
	27-3043	Writers and Authors
	27-3091	Interpreters and Translators
	27-3092	Court Reporters and Simultaneous Captioners
	27-3099	Media and Communication Workers, All Other
	27-4011	Audio and Video Technicians
	27-4012	Broadcast Technicians
	27-4014	Sound Engineering Technicians
	27-4015	Lighting Technicians
	27-4021	Photographers
	27-4031	Camera Operators, Television, Video, and Film
	27-4032	Film and Video Editors
	27-4099	Media and Communication Equipment Workers, All Other
4.A	29-1011	Chiropractors
4.A	29-1021	Dentists, General
4.A	29-1022	Oral and Maxillofacial Surgeons
4.A	29-1023	Orthodontists
4.A	29-1024	Prosthodontists
4.A	29-1029	Dentists, All Other Specialists

4.A	29-1031	Dietitians and Nutritionists
4.A	29-1041	Optometrists
4.A	29-1051	Pharmacists
4.A	29-1071	Physician Assistants
4.A	29-1081	Podiatrists
4.A	29-1122	Occupational Therapists
4.A	29-1123	Physical Therapists
4.A	29-1124	Radiation Therapists
4.A	29-1125	Recreational Therapists
4.A	29-1126	Respiratory Therapists
4.A	29-1127	Speech-Language Pathologists
4.A	29-1128	Exercise Physiologists
4.A	29-1129	Therapists, All Other
4.A	29-1131	Veterinarians
4.A	29-1141	Registered Nurses
4.A	29-1151	Nurse Anesthetists
4.A	29-1161	Nurse Midwives
4.A	29-1171	Nurse Practitioners
4.A	29-1181	Audiologists
4.A	29-1211	Anesthesiologists
4.A	29-1212	Cardiologists
4.A	29-1213	Dermatologists
4.A	29-1214	Emergency Medicine Physicians
4.A	29-1215	Family Medicine Physicians
4.A	29-1216	General Internal Medicine Physicians
4.A	29-1217	Neurologists
4.A	29-1218	Obstetricians and Gynecologists
4.A	29-1221	Pediatricians, General
4.A	29-1222	Physicians, Pathologists
4.A	29-1223	Psychiatrists
4.A	29-1224	Radiologists
4.A	29-1229	Physicians, All Other
4.A	29-1241	Ophthalmologists, Except Pediatric
4.A	29-1242	Orthopedic Surgeons, Except Pediatric
4.A	29-1243	Pediatric Surgeons
4.A	29-1249	Surgeons, All Other
4.A	29-1291	Acupuncturists
4.A	29-1292	Dental Hygienists
4.A	29-1299	Healthcare Diagnosing or Treating Practitioners, All Other
4.B	29-2011	Medical and Clinical Laboratory Technologists
4.B	29-2012	Medical and Clinical Laboratory Technicians
4.B	29-2031	Cardiovascular Technologists and Technicians
4.B	29-2032	Diagnostic Medical Sonographers
4.B	29-2033	Nuclear Medicine Technologists
4.B	29-2034	Radiologic Technologists and Technicians
4.B	29-2035	Magnetic Resonance Imaging Technologists
4.B	29-2036	Medical Dosimetrists
4.B	29-2042	Emergency Medical Technicians
4.B	29-2043	Paramedics
4.B	29-2051	Dietetic Technicians
4.B	29-2052	Pharmacy Technicians
4.B	29-2053	Psychiatric Technicians
4.B	29-2055	Surgical Technologists
4.B	29-2056	Veterinary Technologists and Technicians
4.B	29-2057	Ophthalmic Medical Technicians
4.B	29-2061	Licensed Practical and Licensed Vocational Nurses

4.B	29-2072	Medical Records Specialists
4.B	29-2081	Opticians, Dispensing
4.B	29-2091	Orthotists and Prosthetists
4.B	29-2092	Hearing Aid Specialists
4.B	29-2099	Health Technologists and Technicians, All Other
4.A and 4.B	29-9021	Health Information Technologists and Medical Registrars
4.A	29-9091	Athletic Trainers
4.A	29-9092	Genetic Counselors
4.A	29-9093	Surgical Assistants
4.A and 4.B	29-9099	Healthcare Practitioners and Technical Workers, All Other
	31-1121	Home Health Aides
	31-1122	Personal Care Aides
	31-1131	Nursing Assistants
	31-1132	Orderlies
	31-1133	Psychiatric Aides
	31-2011	Occupational Therapy Assistants
	31-2012	Occupational Therapy Aides
	31-2021	Physical Therapist Assistants
	31-2022	Physical Therapist Aides
	31-9011	Massage Therapists
	31-9091	Dental Assistants
	31-9092	Medical Assistants
	31-9093	Medical Equipment Preparers
	31-9094	Medical Transcriptionists
	31-9095	Pharmacy Aides
	31-9096	Veterinary Assistants and Laboratory Animal Caretakers
	31-9097	Phlebotomists
	31-9099	Healthcare Support Workers, All Other
	33-1011	First-Line Supervisors of Correctional Officers
	33-1012	First-Line Supervisors of Police and Detectives
	33-1021	First-Line Supervisors of Firefighting and Prevention Workers
	33-1091	First-Line Supervisors of Security Workers
	33-1099	First-Line Supervisors of Protective Service Workers, All Other
	33-2011	Firefighters
	33-2021	Fire Inspectors and Investigators
	33-2022	Forest Fire Inspectors and Prevention Specialists
	33-3011	Bailiffs
	33-3012	Correctional Officers and Jailers
	33-3021	Detectives and Criminal Investigators
	33-3031	Fish and Game Wardens
	33-3041	Parking Enforcement Workers
	33-3051	Police and Sheriff's Patrol Officers
	33-3052	Transit and Railroad Police
	33-9011	Animal Control Workers
	33-9021	Private Detectives and Investigators
	33-9031	Gambling Surveillance Officers and Gambling Investigators
	33-9032	Security Guards
	33-9091	Crossing Guards and Flaggers
	33-9092	Lifeguards, Ski Patrol, and Other Recreational Protective Service Workers
	33-9093	Transportation Security Screeners
	33-9094	School Bus Monitors
	33-9099	Protective Service Workers, All Other
	35-1011	Chefs and Head Cooks
	35-1012	First-Line Supervisors of Food Preparation and Serving Workers
	35-2011	Cooks, Fast Food
	35-2012	Cooks, Institution and Cafeteria

35-2013	Cooks, Private Household
35-2014	Cooks, Restaurant
35-2015	Cooks, Short Order
35-2019	Cooks, All Other
35-2021	Food Preparation Workers
35-3011	Bartenders
35-3023	Fast Food and Counter Workers
35-3031	Waiters and Waitresses
35-3041	Food Servers, Nonrestaurant
35-9011	Dining Room and Cafeteria Attendants and Bartender Helpers
35-9021	Dishwashers
35-9031	Hosts and Hostesses, Restaurant, Lounge, and Coffee Shop
35-9099	Food Preparation and Serving Related Workers, All Other
37-1011	First-Line Supervisors of Housekeeping and Janitorial Workers
37-1012	First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers
37-2011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners
37-2012	Maids and Housekeeping Cleaners
37-2019	Building Cleaning Workers, All Other
37-2021	Pest Control Workers
37-3011	Landscaping and Groundskeeping Workers
37-3012	Pesticide Handlers, Sprayers, and Applicators, Vegetation
37-3013	Tree Trimmers and Pruners
37-3019	Grounds Maintenance Workers, All Other
39-1013	First-Line Supervisors of Gambling Services Workers
39-1014	First-Line Supervisors of Entertainment and Recreation Workers, Except Gambling Services
39-1022	First-Line Supervisors of Personal Service Workers
39-2011	Animal Trainers
39-2021	Animal Caretakers
39-3011	Gambling Dealers
39-3012	Gambling and Sports Book Writers and Runners
39-3019	Gambling Service Workers, All Other
39-3021	Motion Picture Projectionists
39-3031	Ushers, Lobby Attendants, and Ticket Takers
39-3091	Amusement and Recreation Attendants
39-3092	Costume Attendants
39-3093	Locker Room, Coatroom, and Dressing Room Attendants
39-3099	Entertainment Attendants and Related Workers, All Other
39-4011	Embalmers
39-4012	Crematory Operators
39-4021	Funeral Attendants
39-4031	Morticians, Undertakers, and Funeral Arrangers
39-5011	Barbers
39-5012	Hairdressers, Hairstylists, and Cosmetologists
39-5091	Makeup Artists, Theatrical and Performance
39-5092	Manicurists and Pedicurists
39-5093	Shampooers
39-5094	Skincare Specialists
39-6011	Baggage Porters and Bellhops
39-6012	Concierges
39-7011	Tour Guides and Escorts
39-7012	Travel Guides
39-9011	Childcare Workers
39-9031	Exercise Trainers and Group Fitness Instructors
39-9032	Recreation Workers
39-9041	Residential Advisors
39-9099	Personal Care and Service Workers, All Other

	41-1011	First-Line Supervisors of Retail Sales Workers
	41-1012	First-Line Supervisors of Non-Retail Sales Workers
	41-2011	Cashiers
	41-2012	Gambling Change Persons and Booth Cashiers
	41-2021	Counter and Rental Clerks
	41-2022	Parts Salespersons
	41-2031	Retail Salespersons
	41-3011	Advertising Sales Agents
	41-3021	Insurance Sales Agents
	41-3031	Securities, Commodities, and Financial Services Sales Agents
	41-3041	Travel Agents
	41-3091	Sales Representatives of Services, Except Advertising, Insurance, Financial Services, and Travel
1.E	41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
	41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products
	41-9011	Demonstrators and Product Promoters
	41-9012	Models
	41-9021	Real Estate Brokers
	41-9022	Real Estate Sales Agents
1.E	41-9031	Sales Engineers
	41-9041	Telemarketers
	41-9091	Door-to-Door Sales Workers, News and Street Vendors, and Related Workers
	41-9099	Sales and Related Workers, All Other
	43-1011	First-Line Supervisors of Office and Administrative Support Workers
	43-2011	Switchboard Operators, Including Answering Service
	43-2021	Telephone Operators
	43-2099	Communications Equipment Operators, All Other
	43-3011	Bill and Account Collectors
	43-3021	Billing and Posting Clerks
	43-3031	Bookkeeping, Accounting, and Auditing Clerks
	43-3041	Gambling Cage Workers
	43-3051	Payroll and Timekeeping Clerks
	43-3061	Procurement Clerks
	43-3071	Tellers
	43-3099	Financial Clerks, All Other
	43-4011	Brokerage Clerks
	43-4021	Correspondence Clerks
	43-4031	Court, Municipal, and License Clerks
	43-4041	Credit Authorizers, Checkers, and Clerks
	43-4051	Customer Service Representatives
	43-4061	Eligibility Interviewers, Government Programs
	43-4071	File Clerks
	43-4081	Hotel, Motel, and Resort Desk Clerks
	43-4111	Interviewers, Except Eligibility and Loan
	43-4121	Library Assistants, Clerical
	43-4131	Loan Interviewers and Clerks
	43-4141	New Accounts Clerks
	43-4151	Order Clerks
	43-4161	Human Resources Assistants, Except Payroll and Timekeeping
	43-4171	Receptionists and Information Clerks
	43-4181	Reservation and Transportation Ticket Agents and Travel Clerks
	43-4199	Information and Record Clerks, All Other
	43-5011	Cargo and Freight Agents
	43-5021	Couriers and Messengers
	43-5031	Public Safety Telecommunicators
	43-5032	Dispatchers, Except Police, Fire, and Ambulance
	43-5041	Meter Readers, Utilities

43-5051	Postal Service Clerks
43-5052	Postal Service Mail Carriers
43-5053	Postal Service Mail Sorters, Processors, and Processing Machine Operators
43-5061	Production, Planning, and Expediting Clerks
43-5071	Shipping, Receiving, and Inventory Clerks
43-5111	Weighers, Measurers, Checkers, and Samplers, Recordkeeping
43-6011	Executive Secretaries and Executive Administrative Assistants
43-6012	Legal Secretaries and Administrative Assistants
43-6013	Medical Secretaries and Administrative Assistants
43-6014	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive
43-9021	Data Entry Keyers
43-9022	Word Processors and Typists
43-9031	Desktop Publishers
43-9041	Insurance Claims and Policy Processing Clerks
43-9051	Mail Clerks and Mail Machine Operators, Except Postal Service
43-9061	Office Clerks, General
43-9071	Office Machine Operators, Except Computer
43-9081	Proofreaders and Copy Markers
43-9111	Statistical Assistants
43-9199	Office and Administrative Support Workers, All Other
45-1011	First-Line Supervisors of Farming, Fishing, and Forestry Workers
45-2011	Agricultural Inspectors
45-2021	Animal Breeders
45-2041	Graders and Sorters, Agricultural Products
45-2091	Agricultural Equipment Operators
45-2092	Farmworkers and Laborers, Crop, Nursery, and Greenhouse
45-2093	Farmworkers, Farm, Ranch, and Aquacultural Animals
45-2099	Agricultural Workers, All Other
45-3031	Fishing and Hunting Workers
45-4011	Forest and Conservation Workers
45-4021	Fallers
45-4022	Logging Equipment Operators
45-4023	Log Graders and Scalers
45-4029	Logging Workers, All Other
47-1011	First-Line Supervisors of Construction Trades and Extraction Workers
47-2011	Boilermakers
47-2021	Brickmasons and Blockmasons
47-2022	Stonemasons
47-2031	Carpenters
47-2041	Carpet Installers
47-2042	Floor Layers, Except Carpet, Wood, and Hard Tiles
47-2043	Floor Sanders and Finishers
47-2044	Tile and Stone Setters
47-2051	Cement Masons and Concrete Finishers
47-2053	Terrazzo Workers and Finishers
47-2061	Construction Laborers
47-2071	Paving, Surfacing, and Tamping Equipment Operators
47-2072	Pile Driver Operators
47-2073	Operating Engineers and Other Construction Equipment Operators
47-2081	Drywall and Ceiling Tile Installers
47-2082	Tapers
47-2111	Electricians
47-2121	Glaziers
47-2131	Insulation Workers, Floor, Ceiling, and Wall
47-2132	Insulation Workers, Mechanical
47-2141	Painters, Construction and Maintenance

47-2142	Paperhangers
47-2151	Pipelayers
47-2152	Plumbers, Pipefitters, and Steamfitters
47-2161	Plasterers and Stucco Masons
47-2171	Reinforcing Iron and Rebar Workers
47-2181	Roofers
47-2211	Sheet Metal Workers
47-2221	Structural Iron and Steel Workers
47-2231	Solar Photovoltaic Installers
47-3011	Helpers--Brickmasons, Blockmasons, Stonemasons, and Tile and Marble Setters
47-3012	Helpers--Carpenters
47-3013	Helpers--Electricians
47-3014	Helpers--Painters, Paperhangers, Plasterers, and Stucco Masons
47-3015	Helpers--Pipelayers, Plumbers, Pipefitters, and Steamfitters
47-3016	Helpers--Roofers
47-3019	Helpers, Construction Trades, All Other
47-4011	Construction and Building Inspectors
47-4021	Elevator and Escalator Installers and Repairers
47-4031	Fence Erectors
47-4041	Hazardous Materials Removal Workers
47-4051	Highway Maintenance Workers
47-4061	Rail-Track Laying and Maintenance Equipment Operators
47-4071	Septic Tank Servicers and Sewer Pipe Cleaners
47-4091	Segmental Pavers
47-4099	Construction and Related Workers, All Other
47-5011	Derrick Operators, Oil and Gas
47-5012	Rotary Drill Operators, Oil and Gas
47-5013	Service Unit Operators, Oil and Gas
47-5022	Excavating and Loading Machine and Dragline Operators, Surface Mining
47-5023	Earth Drillers, Except Oil and Gas
47-5032	Explosives Workers, Ordnance Handling Experts, and Blasters
47-5041	Continuous Mining Machine Operators
47-5043	Roof Bolters, Mining
47-5044	Loading and Moving Machine Operators, Underground Mining
47-5049	Underground Mining Machine Operators, All Other
47-5051	Rock Splitters, Quarry
47-5071	Roustabouts, Oil and Gas
47-5081	Helpers--Extraction Workers
47-5099	Extraction Workers, All Other
49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers
49-2011	Computer, Automated Teller, and Office Machine Repairers
49-2021	Radio, Cellular, and Tower Equipment Installers and Repairers
49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers
49-2091	Avionics Technicians
49-2092	Electric Motor, Power Tool, and Related Repairers
49-2093	Electrical and Electronics Installers and Repairers, Transportation Equipment
49-2094	Electrical and Electronics Repairers, Commercial and Industrial Equipment
49-2095	Electrical and Electronics Repairers, Powerhouse, Substation, and Relay
49-2096	Electronic Equipment Installers and Repairers, Motor Vehicles
49-2097	Audiovisual Equipment Installers and Repairers
49-2098	Security and Fire Alarm Systems Installers
49-3011	Aircraft Mechanics and Service Technicians
49-3021	Automotive Body and Related Repairers
49-3022	Automotive Glass Installers and Repairers
49-3023	Automotive Service Technicians and Mechanics
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists

49-3041	Farm Equipment Mechanics and Service Technicians
49-3042	Mobile Heavy Equipment Mechanics, Except Engines
49-3043	Rail Car Repairers
49-3051	Motorboat Mechanics and Service Technicians
49-3052	Motorcycle Mechanics
49-3053	Outdoor Power Equipment and Other Small Engine Mechanics
49-3091	Bicycle Repairers
49-3092	Recreational Vehicle Service Technicians
49-3093	Tire Repairers and Changers
49-9011	Mechanical Door Repairers
49-9012	Control and Valve Installers and Repairers, Except Mechanical Door
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers
49-9031	Home Appliance Repairers
49-9041	Industrial Machinery Mechanics
49-9043	Maintenance Workers, Machinery
49-9044	Millwrights
49-9045	Refractory Materials Repairers, Except Brickmasons
49-9051	Electrical Power-Line Installers and Repairers
49-9052	Telecommunications Line Installers and Repairers
49-9061	Camera and Photographic Equipment Repairers
49-9062	Medical Equipment Repairers
49-9063	Musical Instrument Repairers and Tuners
49-9064	Watch and Clock Repairers
49-9069	Precision Instrument and Equipment Repairers, All Other
49-9071	Maintenance and Repair Workers, General
49-9081	Wind Turbine Service Technicians
49-9091	Coin, Vending, and Amusement Machine Servicers and Repairers
49-9092	Commercial Divers
49-9094	Locksmiths and Safe Repairers
49-9095	Manufactured Building and Mobile Home Installers
49-9096	Riggers
49-9097	Signal and Track Switch Repairers
49-9098	Helpers--Installation, Maintenance, and Repair Workers
49-9099	Installation, Maintenance, and Repair Workers, All Other
51-1011	First-Line Supervisors of Production and Operating Workers
51-2011	Aircraft Structure, Surfaces, Rigging, and Systems Assemblers
51-2021	Coil Winders, Tapers, and Finishers
51-2022	Electrical and Electronic Equipment Assemblers
51-2023	Electromechanical Equipment Assemblers
51-2031	Engine and Other Machine Assemblers
51-2041	Structural Metal Fabricators and Fitters
51-2051	Fiberglass Laminators and Fabricators
51-2061	Timing Device Assemblers and Adjusters
51-2092	Team Assemblers
51-2099	Assemblers and Fabricators, All Other
51-3011	Bakers
51-3021	Butchers and Meat Cutters
51-3022	Meat, Poultry, and Fish Cutters and Trimmers
51-3023	Slaughterers and Meat Packers
51-3091	Food and Tobacco Roasting, Baking, and Drying Machine Operators and Tenders
51-3092	Food Batchmakers
51-3093	Food Cooking Machine Operators and Tenders
51-3099	Food Processing Workers, All Other
51-4021	Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic
51-4022	Forging Machine Setters, Operators, and Tenders, Metal and Plastic
51-4023	Rolling Machine Setters, Operators, and Tenders, Metal and Plastic

51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic
51-4032	Drilling and Boring Machine Tool Setters, Operators, and Tenders, Metal and Plastic
51-4033	Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic
51-4034	Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic
51-4035	Milling and Planing Machine Setters, Operators, and Tenders, Metal and Plastic
51-4041	Machinists
51-4051	Metal-Refining Furnace Operators and Tenders
51-4052	Pourers and Casters, Metal
51-4061	Model Makers, Metal and Plastic
51-4062	Patternmakers, Metal and Plastic
51-4071	Foundry Mold and Coremakers
51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic
51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic
51-4111	Tool and Die Makers
51-4121	Welders, Cutters, Solderers, and Brazers
51-4122	Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders
51-4191	Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic
51-4192	Layout Workers, Metal and Plastic
51-4193	Plating Machine Setters, Operators, and Tenders, Metal and Plastic
51-4194	Tool Grinders, Filers, and Sharpeners
51-4199	Metal Workers and Plastic Workers, All Other
51-5111	Prepress Technicians and Workers
51-5112	Printing Press Operators
51-5113	Print Binding and Finishing Workers
51-6011	Laundry and Dry-Cleaning Workers
51-6021	Pressers, Textile, Garment, and Related Materials
51-6031	Sewing Machine Operators
51-6041	Shoe and Leather Workers and Repairers
51-6042	Shoe Machine Operators and Tenders
51-6051	Sewers, Hand
51-6052	Tailors, Dressmakers, and Custom Sewers
51-6061	Textile Bleaching and Dyeing Machine Operators and Tenders
51-6062	Textile Cutting Machine Setters, Operators, and Tenders
51-6063	Textile Knitting and Weaving Machine Setters, Operators, and Tenders
51-6064	Textile Winding, Twisting, and Drawing Out Machine Setters, Operators, and Tenders
51-6091	Extruding and Forming Machine Setters, Operators, and Tenders, Synthetic and Glass Fibers
51-6092	Fabric and Apparel Patternmakers
51-6093	Upholsterers
51-6099	Textile, Apparel, and Furnishings Workers, All Other
51-7011	Cabinetmakers and Bench Carpenters
51-7021	Furniture Finishers
51-7031	Model Makers, Wood
51-7032	Patternmakers, Wood
51-7041	Sawing Machine Setters, Operators, and Tenders, Wood
51-7042	Woodworking Machine Setters, Operators, and Tenders, Except Sawing
51-7099	Woodworkers, All Other
51-8011	Nuclear Power Reactor Operators
51-8012	Power Distributors and Dispatchers
51-8013	Power Plant Operators
51-8021	Stationary Engineers and Boiler Operators
51-8031	Water and Wastewater Treatment Plant and System Operators
51-8091	Chemical Plant and System Operators
51-8092	Gas Plant Operators
51-8093	Petroleum Pump System Operators, Refinery Operators, and Gaugers
51-8099	Plant and System Operators, All Other
51-9011	Chemical Equipment Operators and Tenders

51-9012	Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders
51-9021	Crushing, Grinding, and Polishing Machine Setters, Operators, and Tenders
51-9022	Grinding and Polishing Workers, Hand
51-9023	Mixing and Blending Machine Setters, Operators, and Tenders
51-9031	Cutters and Trimmers, Hand
51-9032	Cutting and Slicing Machine Setters, Operators, and Tenders
51-9041	Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders
51-9051	Furnace, Kiln, Oven, Drier, and Kettle Operators and Tenders
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers
51-9071	Jewelers and Precious Stone and Metal Workers
51-9081	Dental Laboratory Technicians
51-9082	Medical Appliance Technicians
51-9083	Ophthalmic Laboratory Technicians
51-9111	Packaging and Filling Machine Operators and Tenders
51-9123	Painting, Coating, and Decorating Workers
51-9124	Coating, Painting, and Spraying Machine Setters, Operators, and Tenders
51-9141	Semiconductor Processing Technicians
51-9151	Photographic Process Workers and Processing Machine Operators
51-9161	Computer Numerically Controlled Tool Operators
51-9162	Computer Numerically Controlled Tool Programmers
51-9191	Adhesive Bonding Machine Operators and Tenders
51-9192	Cleaning, Washing, and Metal Pickling Equipment Operators and Tenders
51-9193	Cooling and Freezing Equipment Operators and Tenders
51-9194	Etchers and Engravers
51-9195	Molders, Shapers, and Casters, Except Metal and Plastic
51-9196	Paper Goods Machine Setters, Operators, and Tenders
51-9197	Tire Builders
51-9198	Helpers--Production Workers
51-9199	Production Workers, All Other
53-1041	Aircraft Cargo Handling Supervisors
53-1042	First-Line Supervisors of Helpers, Laborers, and Material Movers, Hand
53-1043	First-Line Supervisors of Material-Moving Machine and Vehicle Operators
53-1044	First-Line Supervisors of Passenger Attendants
53-1049	First-Line Supervisors of Transportation Workers, All Other
53-2011	Airline Pilots, Copilots, and Flight Engineers
53-2012	Commercial Pilots
53-2021	Air Traffic Controllers
53-2022	Airfield Operations Specialists
53-2031	Flight Attendants
53-3011	Ambulance Drivers and Attendants, Except Emergency Medical Technicians
53-3031	Driver/Sales Workers
53-3032	Heavy and Tractor-Trailer Truck Drivers
53-3033	Light Truck Drivers
53-3051	Bus Drivers, School
53-3052	Bus Drivers, Transit and Intercity
53-3053	Shuttle Drivers and Chauffeurs
53-3054	Taxi Drivers
53-3099	Motor Vehicle Operators, All Other
53-4011	Locomotive Engineers
53-4013	Rail Yard Engineers, Dinkey Operators, and Hostlers
53-4022	Railroad Brake, Signal, and Switch Operators and Locomotive Firers
53-4031	Railroad Conductors and Yardmasters
53-4041	Subway and Streetcar Operators
53-4099	Rail Transportation Workers, All Other
53-5011	Sailors and Marine Oilers
53-5021	Captains, Mates, and Pilots of Water Vessels

53-5022	Motorboat Operators
53-5031	Ship Engineers
53-6011	Bridge and Lock Tenders
53-6021	Parking Attendants
53-6031	Automotive and Watercraft Service Attendants
53-6032	Aircraft Service Attendants
53-6041	Traffic Technicians
53-6051	Transportation Inspectors
53-6061	Passenger Attendants
53-6099	Transportation Workers, All Other
53-7011	Conveyor Operators and Tenders
53-7021	Crane and Tower Operators
53-7031	Dredge Operators
53-7041	Hoist and Winch Operators
53-7051	Industrial Truck and Tractor Operators
53-7061	Cleaners of Vehicles and Equipment
53-7062	Laborers and Freight, Stock, and Material Movers, Hand
53-7063	Machine Feeders and Offbearers
53-7064	Packers and Packagers, Hand
53-7065	Stockers and Order Fillers
53-7071	Gas Compressor and Gas Pumping Station Operators
53-7072	Pump Operators, Except Wellhead Pumpers
53-7073	Wellhead Pumpers
53-7081	Refuse and Recyclable Material Collectors
53-7121	Tank Car, Truck, and Ship Loaders
53-7199	Material Moving Workers, All Other
55-1011	Air Crew Officers
55-1012	Aircraft Launch and Recovery Officers
55-1013	Armored Assault Vehicle Officers
55-1014	Artillery and Missile Officers
55-1015	Command and Control Center Officers
55-1016	Infantry Officers
55-1017	Special Forces Officers
55-1019	Military Officer Special and Tactical Operations Leaders, All Other
55-2011	First-Line Supervisors of Air Crew Members
55-2012	First-Line Supervisors of Weapons Specialists/Crew Members
55-2013	First-Line Supervisors of All Other Tactical Operations Specialists
55-3011	Air Crew Members
55-3012	Aircraft Launch and Recovery Specialists
55-3013	Armored Assault Vehicle Crew Members
55-3014	Artillery and Missile Crew Members
55-3015	Command and Control Center Specialists
55-3016	Infantry
55-3018	Special Forces
55-3019	Military Enlisted Tactical Operations and Air/Weapons Specialists and Crew Members, All Other

Appendix B

LARE Orientation: Understanding the Landscape Architect Registration Examination, Council of Landscape Architectural Registration Boards (CLARB)

Section 1 - Project and Construction Management

85 scored items & 15 pretest items consisting of multiple-choice and multiple-response questions; 3 hours seat time, 2 ½ hours for exam

Pre-Project Management: 10%	Project Management: 30%	Bidding: 20%	Construction: 30%	Maintenance: 10%
• Select Project Team • Develop Contract • Negotiate Contract • Prepare RFPs or RFQs • Determine Project Scope, Schedule, and Budget	• Manage Project Team • Manage Project Scope, Schedule, and Budget • Determine Common Goals and Objectives • Establish Quality Control Procedures and Conduct Quality Control Review • Facilitate Meetings Coordinate Work of/with Other Disciplines Document Design Decisions and Project Communication • Execute Records Retention Policy • Facilitate Client Review and Coordination • Obtain Permits • Prepare Cost Estimates • Prepare Project Deliverables	• Develop Bidding Criteria • Prepare and Issue Addenda • Facilitate Meetings • Evaluate Bids and Make Recommendations • Identify Delivery Methods • Evaluate Contractor Qualifications • Assist with Construction Contract Execution and Administration	• Respond to RFIs • Coordinate with Contractors • Facilitate Pre-Construction Meeting • Document Pre-Construction Existing Conditions • Review Submittals • Prepare Change Orders • Conduct and Document Construction-related Actions • Prepare Drawing Revisions or Clarification Sketches • Review and Certify Applications for Payment • Attend Substantial Completion (practical completion) Walkthrough and Prepare Punch List (deficiency list) • Attend Final Completion Walkthrough • Prepare As-Built (record) Drawings • Conduct Warranty Review • Conduct Project Close-out • Collect and Analyze Performance Metrics	• Estimate Maintenance and Management Costs • Prepare Maintenance and Operation Manual • Review Maintenance Services • Prepare Management Plan

Section 2 – Inventory and Analysis

70 scored items & 10 pretest items consisting of multiple-choice and multiple-response, 2 ½ hours seat time, 2 hours for the exam

Site Inventory: 35%	Physical Analysis: 40%	Contextual Analysis: 25%
• Determine Applicable Codes, Regulations, and Permitting Requirements • Collect Contextual Data • Gather Stakeholder Input • Identify Policy Objectives • Conduct Project Related Research • Conduct Onsite Investigation and Fieldwork • Document Site Inventory • Determine Performance Metrics	• Determine Appropriate Types of Analyses • Perform Circulation Analysis • Interpret Utility Analysis • Perform Visual Resource Analysis • Perform Micro and Macro Climate Analysis • Perform Hydrological Analysis • Perform Vegetation Analysis • Interpret Ecological Analysis • Perform Topographical Analysis • Interpret Soil and Geotechnical/Geological Analysis • Interpret Environmental Studies	• Analyze Codes, Regulations, and Permitting Requirements for Design Impact • Interpret Cultural, Historical, and Archeological Analysis • Interpret Social Analysis • Interpret Economic Analysis • Analyze Contextual Data • Analyze Stakeholder Feedback

Section 3 – Design

85 scored items & 15 pretest items consisting of advanced item types, multiple-choice and multiple-response questions; 4 hours seat time, 3 ½ hours for the exam

Stakeholder Process: 9%	Master Planning: 45%	Site Design: 46%
• Design and Execute Public Participation Process • Prioritize Stakeholder Goals • Initiate Communication Strategy • Synthesize Stakeholder Feedback • Communicate Concept(s)/Schematic(s)	• Perform Site Analysis and Determine Opportunities and Constraints • Develop Vision or Framework Plan • Develop and Conduct Urban Plan • Develop Land Use Plan • Develop Strategic Implementation Plan • Develop Site Master Plan • Develop Historic/Cultural Restoration and Preservation Plan • Develop Parks, Open Space, and Trails Master Plan • Develop Design Guidelines • Develop a Feasibility Study • Develop View Corridor Plan • Develop Redevelopment Plan • Develop Environmental Resources Plan • Develop Multi-modal Transportation Plan	• Synthesize and Apply the Site Analysis • Develop and Refine the Program • Create the Basis for the Design • Create Conceptual Design Alternatives and Scenarios • Evaluate Design Alternatives • Refine and Synthesize Concept Alternative • Develop Schematic Design • Prepare Preliminary Quantities and Cost Estimate • Prepare Presentation Drawings and Communication Tools • Compile Materials Sample Board • Identify and Develop Performance Metrics

Section 4 – Grading, Drainage and Construction Documentation

105 scored items & 15 pretest items consisting of advanced item types, multiple-choice and multiple-response questions; 4 ½ hours seat time, 4 hours for the exam

Site Preparation Plans: 20%	General Plans and Details: 40%	Specialty Plans: 25%	Specifications: 15%
• Develop Demolition Plan • Develop Existing Conditions Plan • Prepare Soil Boring Location Plan • Develop Stormwater Pollution Prevention Plan • Develop Site Protection Plan • Develop Mitigation Plan	• Develop Layout Plan • Develop General Notes • Develop Grading and Drainage Plan • Develop Planting Practices, Plans, Notes and Schedules • Develop Materials Plan • Develop Details • Prepare Sections, Elevations, and Profiles • Incorporate Code Requirements • Prepare Summary of Quantities • Prepare Site Infrastructure Plan	• Develop Phasing Plan • Develop Irrigation Plan • Prepare Lighting Plan • Develop Site Furnishings Plan • Develop Signage and Wayfinding Plan • Develop Traffic Control Plan • Develop Emergency Access Plan • Prepare Stormwater Management Plan	• Develop Technical Specifications • Prepare Bid Form/Schedule • Develop Project Manual/Front End Specifications

Appendix C

ASLA Survey of Landscape Architecture Schools, May 2021.
Charts assembled by Agora Consulting

AVERAGE NUMBER OF REQUIRED COURSES WITH STEM CONTENT

BLA Programs

	Botany/ Horticulture	*Construction Methods and Methods*	*Ecology*	*Engineering*	*Geology*	*Hydrology*	*Mathematics*	*Storm Water Management/Drainage*	*Sustainability Studies*	*Vehicular and Pedestrian Circulation/ Roadway Alignment & Design*
TAMU BLA	5	8	8	2	3	6	2	6	15	5
MSU BLA	4	4	4	4	2	3	2	2	8	1
UTAH BLA	2	3	1	0	1	0	1	1	0	1
UW-Mad	2	1	2	0	0	0	1	1	1	0
ColoSU	8	7	9	10	9	8	6	9	8	8
PennStB	4	2	4	1	1	1	2	1	2	5
AVG	**4.2**	**4.2**	**4.7**	**2.8**	**2.7**	**3.0**	**2.3**	**3.3**	**5.7**	**3.3**

MLA Programs

	Botany/ Horticulture	*Construction Methods and Methods*	*Ecology*	*Engineering*	*Geology*	*Hydrology*	*Mathematics*	*Storm Water Management/Drainage*	*Sustainability Studies*	*Vehicular and Pedestrian Circulation/ Roadway Alignment & Design*
TAMU MLA	3	4	8	8	2	4	2	5	10	6
MSU MLA	2	2	2	2	0	3	1	3	16	1
UTAH MLA	0	1	1	0	0	0	0	1	0	1
PENN	2	1	3	1	1	1	0	1	0	0
RISD MLA	2	5	3	2	0	1	0	1	2	0
PennState	4	2	4	1	0	1	0	1	0	5
UNM	7	6	5	5	3	3	6	3	7	3
UT Austin	1	1	4	1	0	0	0	0	0	1
AVG	**2.6**	**2.8**	**3.8**	**2.5**	**0.8**	**1.6**	**1.1**	**1.9**	**4.4**	**2.1**

University/Program Reviewed: **Colorado State University BSLA**

Required/optional courses that cover any of the following topics:	Course name(s)	Degree level(s)	Required or Optional?	Number of courses in topic required through all years of program
Botany/Horticulture	BZ120 - Principles of Plant Biology SOCR240 - Introductory Soil Science BZ223 or HORT221 - Plant Identification or Landscape Plants Studio/Lab: LAND240 - Fundamentals of Landscape Design Process Studio/Lab: LAND364 - Design and Nature Studio/Lab: LAND366 - Landscape Design Expression Studio/Lab: LAND 454 - Landscape Field Studies Studio/Lab: LAND447 - Comprehensive Landscape Design	BLA	Required	8
Construction Materials and methods	LAND360 - Basic Landscape Design and Construction LAND363 - Advanced Landscape Site Engineering LAND365 - Landscape Contract Drawing and Specifications LAND368 - Landscape Irrigation and Water Conservation Studio/Lab: LAND230 - Drawing the Landscape Studio/Lab: LAND240 - Fundamentals of Landscape Design Process Studio/Lab: LAND 364 - Design and Nature	BLA	Required	7
Ecology	LAND241 - Environmental Analysis LAND220 - Fundamentals of Ecology LAND444 - Ecology of Landscapes Studio/Lab: LAND110 - Introduction to Landscape Architecture Studio/Lab: LAND240 - Fundamentals of Landscape Design Process Studio/Lab: LAND 364 - Design and Nature Studio/Lab: LAND366 - Landscape Design Expression Studio/Lab: LAND 454 - Landscape Field Studies Studio/Lab: LAND447 - Comprehensive Landscape Design	BLA	Required	9
Engineering	LAND360 - Basic Landscape Design and Construction LAND363 - Advanced Landscape Site Engineering LAND365 - Landscape Contract Drawing and Specifications LAND368 - Landscape Irrigation and Water Conservation LAND510 - Virtual Design Methods Studio/Lab: LAND230 - Drawing the Landscape Studio/Lab: LAND240 - Fundamentals of Landscape Design Process Studio/Lab: LAND 364 - Design and Nature Studio/Lab: LAND446 - Urban Design Studio/Lab: LAND447 - Comprehensive Landscape Design	BLA	Required	10
Geology	GEOL120 or 122 - Exploring Earth / The Blue Planet GEOL121 - Introductory Geology Laboratory NR319 or NR323 - Geospatial Applications OR Remote Sensity of Natural Resources LAND520 - Geographical Information Systems Studio/Lab: LAND240 - Fundamentals of Landscape Design Process Studio/Lab: LAND364 - Design and Nature Studio/Lab: LAND366 - Landscape Design Expression Studio/Lab: LAND 454 - Landscape Field Studies Studio/Lab: LAND447 - Comprehensive Landscape Design	BLA	Required	9

Hydrology	LAND360 - Basic Landscape Design and Construction LAND363 - Advanced Landscape Site Engineering LAND368 - Landscape Irrigation and Water Conservation Studio/Lab: LAND240 - Fundamentals of Landscape Design Process Studio/Lab: LAND364 - Design and Nature Studio/Lab: LAND366 - Landscape Design Expression Studio/Lab: LAND 454 - Landscape Field Studies Studio/Lab: LAND447 - Comprehensive Landscape Design	BLA	Required	8
Mathematics	MATH126 - Analytical Trigonometry LAND360 - Basic Landscape Design and Construction LAND363 - Advanced Landscape Site Engineering ECON202 or AREC202 Principles of Microeconomics – or – Ag. and Resource Economics Studio/Lab: LAND230 - Drawing the Landscape Studio/Lab: LAND447 - Comprehensive Landscape Design	BLA	Required	6
Stormwater management/drainage	LAND360 - Basic Landscape Design and Construction LAND363 - Advanced Landscape Site Engineering LAND368 - Landscape Irrigation and Water Conservation Studio/Lab: LAND110 - Introduction to Landscape Architecture Studio/Lab: LAND240 - Fundamentals of Landscape Design Process Studio/Lab: LAND364 - Design and Nature Studio/Lab: LAND366 - Landscape Design Expression Studio/Lab: LAND 454 - Landscape Field Studies Studio/Lab: LAND447 - Comprehensive Landscape Design	BLA	Required	9
Sustainability Studies	LAND360 - Basic Landscape Design and Construction LAND368 - Landscape Irrigation and Water Conservation Studio/Lab: LAND110 - Introduction to Landscape Architecture Studio/Lab: LAND240 - Fundamentals of Landscape Design Process Studio/Lab: LAND364 - Design and Nature Studio/Lab: LAND366 - Landscape Design Expression Studio/Lab: LAND 454 - Landscape Field Studies Studio/Lab: LAND447 - Comprehensive Landscape Design	BLA	Required	8
Vehicular and pedestrian circulation/roadway alignment design	LAND360 - Basic Landscape Design and Construction LAND363 - Advanced Landscape Site Engineering Studio/Lab: LAND110 - Introduction to Landscape Architecture Studio/Lab: LAND240 - Fundamentals of Landscape Design Process Studio/Lab: LAND364 - Design and Nature Studio/Lab: LAND366 - Landscape Design Expression Studio/Lab: LAND446 - Urban Design Studio/Lab: LAND447 - Comprehensive Landscape Design	BLA	Required	8

University/Program Reviewed: **Mississippi State BLA**

Required/optional courses that cover any of the following topics:	Course name(s)	Degree level(s)	Required or Optional?	Number of courses in topic required through all years of program
Botany/Horticulture	LA 1333 Landscape Systems and Plant Communities	BLA	Required	4
	LA 3653 Planting Design Fundamentals in Landscape Architecture	BLA	Required	
	LA 4514 Ecological Planting Design	BLA	Required	
	LA 4753 Sustainable Landscape Management	BLA	Optional	
	LA 4853 Sustainable Communities	BLA	Required	
Construction Materials and methods	LA 2544 Landscape Architecture Construction I	BLA	Required	4
	LA 2644 Landscape Architecture Construction II	BLA	Required	
	LA 2644 Landscape Architecture Construction III	BLA	Required	
	LA 4344 Landscape Architecture Construction IV	BLA	Optional	
	LA 4124 Landscape Architecture Construction V - Construction Documents	BLA	Optional	
	LA 4443 Exterior Design-Build Studio	BLA	Required	
Ecology	LA 1333 Landscape Systems and Plant Communities	BLA	Required	4
	LA 3653 Planting Design Fundamentals in Landscape Architecture	BLA	Required	
	LA 4514 Ecological Planting Design	BLA	Required	
	LA 4753 Sustainable Landscape Management	BLA	Optional	
	LA 4853 Sustainable Communities	BLA	Required	
Engineering	LA 2544 Landscape Architecture Construction I	BLA	Required	4
	LA 2644 Landscape Architecture Construction II	BLA	Required	
	LA 2644 Landscape Architecture Construction III	BLA	Required	
	LA 4344 Landscape Architecture Construction IV	BLA	Optional	
	LA 4124 Landscape Architecture Construction V - Construction Documents	BLA	Optional	
	LA 4443 Exterior Design-Build Studio	BLA	Required	
	LA 4523 Applications for GIS in Landscape Architects	BLA	Optional	
Geology	GG 1111 Earth Science I Lab	BLA	Required	2
	GG 1113 Survey of Earth Sciences I	BLA	Required	
	GG 1121 Earth Science II Lab	BLA	Optional	
	GG 1123 Survey of Earth Sciences II	BLA	Optional	
Hydrology	LA 4753 Sustainable Landscape Management	BLA	Optional	3
	LA 2644 Landscape Architecture Construction II	BLA	Required	
	LA 2644 Landscape Architecture Construction III	BLA	Required	
	LA 4344 Landscape Architecture Construction IV	BLA	Optional	
	LA 4124 Landscape Architecture Construction V - Construction Documents	BLA	Optional	
	LA 4443 Exterior Design-Build Studio	BLA	Required	
Mathematics	MA 1313 College Algebra	BLA	Required	2
	MA 1323 Trigonometry	BLA	Required	
	MA 1613 Calculus I	BLA	Optional	
	MA 2113 Introduction to Statistics	BLA	Optional	
Stormwater management/drainage	LA 4753 Sustainable Landscape Management	BLA	Optional	2
	LA 2644 Landscape Architecture Construction II	BLA	Required	
	LA 2644 Landscape Architecture Construction III	BLA	Required	
Sustainability Studies	LA 4753 Sustainable Landscape Management	BLA	Optional	8
	LA 4853 Sustainable Communities	BLA	Required	
	LA 2554 Landscape Architecture Design Studio I	BLA	Required	
	LA 2654 Landscape Architecture Design Studio II	BLA	Required	
	LA 3454 Landscape Architecture Design Studio III - Small Town/Rural	BLA	Required	
	LA 3623 Urban Planning Theory	BLA	Required	
	LA 3454 Landscape Architecture Design Studio IV - Urban Design	BLA	Required	
	LA 4523 Applications for GIS in Landscape Architects	BLA	Optional	
	LA 3454 Landscape Architecture Design Studio V - Regional	BLA	Required	
	LA 3454 Landscape Architecture Capstone Studio	BLA	Required	
Vehicular and pedestrian circulation/roadway alignment design	LA 2644 Landscape Architecture Construction II	BLA	Required	1

University/Program Reviewed: **Mississippi State MLA**

Required/optional courses that cover any of the following topics:	Course name(s)	Degree level(s)	Required or Optional?	Number of courses in topic required through all years of program
Botany/Horticulture	LA 1333 Landscape Systems and Plant Communities	MLA	Required	2
	LA 3653 Planting Design Fundamentals in Landscape Architecture	MLA	Required	
	LA 6463 Community Food Systems	MLA	Optional	
	LA 6514 Ecological Planting Design	MLA	Optional	
	LA 6753 Sustainable Landscape Management	MLA	Optional	
	LA 6853 Sustainable Communities	MLA	Optional	
Construction Materials and methods	LA 2544 Landscape Architecture Construction I - Materials	MLA	Required	2
	LA 2644 Landscape Architecture Construction II - Grading	MLA	Required	
	LA 2644 Landscape Architecture Construction III - Hydrology	MLA	Optional	
	LA 4344 Landscape Architecture Construction IV	MLA	Optional	
	LA 4124 Landscape Architecture Construction V - Construction Documents	MLA	Optional	
	LA 4443 Exterior Design-Build Studio	MLA	Optional	
Ecology	LA 1333 Landscape Systems and Plant Communities	MLA	Required	2
	LA 3653 Planting Design Fundamentals in Landscape Architecture	MLA	Required	
	LA 6463 Community Food Systems	MLA	Optional	
	LA 6514 Ecological Planting Design	MLA	Optional	
	LA 6753 Sustainable Landscape Management	MLA	Optional	
	LA 6853 Sustainable Communities	MLA	Optional	
Engineering	LA 2544 Landscape Architecture Construction I - Materials	MLA	Required	2
	LA 2644 Landscape Architecture Construction II - Grading	MLA	Required	
	LA 2644 Landscape Architecture Construction III - Hydrology	MLA	Optional	
	LA 4344 Landscape Architecture Construction IV	MLA	Optional	
	LA 4124 Landscape Architecture Construction V - Construction Documents	MLA	Optional	
	LA 4443 Exterior Design-Build Studio	MLA	Optional	
Geology				0
Hydrology	LA 6753 Sustainable Landscape Management	MLA	Optional	3
	LA 2644 Landscape Architecture Construction II - Grading	MLA	Required	
	LA 2644 Landscape Architecture Construction III - Hydrology	MLA	Optional	
	LA 4344 Landscape Architecture Construction IV	MLA	Optional	
	LA 4124 Landscape Architecture Construction V - Construction Documents	MLA	Optional	
	LA 4443 Exterior Design-Build Studio	MLA	Optional	
	LA 8513 Landscape Architecture Graduate Studio I	MLA	Required	
	LA 8522 Landscape Architecture Graduate Studio II	MLA	Required	
Mathematics	SO 8274 Graduate Social Statistics I	MLA	Optional	1
	ST 8114 Statistical Methods	MLA	Optional	
	LA 6463 Community Food Systems	MLA	Optional	
	LA 1223 Computers in Landscape Architecture	MLA	Required	
	LA 4523 Applications for GIS in Landscape Architects	MLA	Optional	
Stormwater management/drainage	LA 6753 Sustainable Landscape Management	MLA	Optional	3
	LA 2644 Landscape Architecture Construction II - Grading	MLA	Required	
	LA 2644 Landscape Architecture Construction III - Hydrology	MLA	Optional	
	LA 8513 Landscape Architecture Graduate Studio I	MLA	Required	
	LA 8522 Landscape Architecture Graduate Studio II	MLA	Required	
Sustainability Studies	LA 2554 Landscape Architecture Design Studio I	MLA	Required	16
	LA 2654 Landscape Architecture Design Studio II	MLA	Required	
	LA 4523 Applications for GIS in Landscape Architects	MLA	Required	
	LA 8512 Landscape Architecture Graduate Studio I	MLA	Required	
	LA 8513 Landscape Architecture Graduate Studio I	MLA	Required	
	LA 8522 Landscape Architecture Graduate Studio II	MLA	Required	
	LA 8523 Landscape Architecture Graduate Studio II	MLA	Required	
	LA 8532 Landscape Architecture Graduate Studio III	MLA	Required	
	LA 8533 Landscape Architecture Graduate Studio III	MLA	Required	
	LA 8545 Landscape Architecture Graduate Studio IV - Case Study	MLA	Required	
	LA 8613 Research Methods in Landscape Architecture	MLA	Required	
	LA 8711 Seminar in Watershed Planning and Management	MLA	Required	
	LA 8721 Seminar in Landscape Management	MLA	Required	

	LA 8731 Seminar in Community Based Planning	MLA	Required	
	LA 8741 Proposal Writing Seminar	MLA	Required	
	LA 8751 Seminar in Contemporary Issues	MLA	Required	
	LA 6753 Sustainable Landscape Management	MLA	Optional	
	LA 6853 Sustainable Communities	MLA	Optional	
Vehicular and pedestrian circulation/roadway alignment design	LA 2644 Landscape Architecture Construction II - Grading	MLA	Required	1

University/Program Reviewed: **Penn State**

Required/optional courses that cover any of the following topics:	Course name(s)	Degree level(s)	Required or Optional?	Number of courses in topic required through all years of program (BLA)	Number of courses in topic required through all years of program (MLA)
Botany/Horticulture	(See ecology courses)			4	4
Construction Materials and methods	LArch 236 Materials; LArch 335 Planting Methods	BLA, MLA	Required	2	2
Ecology	LArch 145 - Ecol & Plants I; LArch 245 Ecol & Plants II; LArch 246 Ridge & Valley Field Trip; LArch 216 Natural & Cultural Systems studio	BLA, MLA	Required	4	4
Engineering	LArch 245 Grading	BLA, MLA	Required	1	1
Geology	Soils 101	BLA	Required	1	
Hydrology	(see stormwater course)			1	1
Mathematics	2 gen eds (variable courses)	BLA	Required	2	
Stormwater management/drainage	LArch 336 Stormwater	BLA, MLA	Required	1	1
Sustainability Studies	2 required natural sciences gen eds (beyond soils)	BLA	Required	2	
Vehicular and pedestrian circulation/roadway alignment design	LArch 215 Design III: Site Design; LArch 315 Design V: Expanded Use, Scale, and Context; LArch 414 (3 required upper level studios with varied topics)	BLA, MLA	Required	5	5

University/Program Reviewed: **Rhode Island School of Design, Department of Landscape Architecture, MLA**

Required/optional courses that cover any of the following topics:	Course name(s)	Degree level(s)	Required or Optional?	Number of courses in topic required through all years of program
Botany/Horticulture	LDAR 2252 Plants Botany + Ecology	ML	Required	2
	LDAR-2253 Plants Form + Space	MLA	Required	
Construction Materials and methods	LDAR 2251 Material Logic Wood Metal + Stone	MLA	Required	5
	LDAR-2266 Material Tests Prototyping + Digi Fab	MLA	Required	
	LDAR 2254 Material Assemblies Detailing + Construction	MLA	Required	
	LDAR 231G Topics In Representation	MLA	Required	
	LDAR 232G Topics in Representation 2	MLA	Required	
Ecology	LDAR 2256 Design Foundations + Field Ecology	MLA	Required	3
	LDAR 2203 Site Ecology + Design	MLA	Required	
	LDAR 2201 Design Principles	MLA	Required	
Engineering	LDAR W207 Constructed Ground Terrain + Earthwork	MLA	Required	2
	LDAR 2204 Constructed Landscapes	MLA	Required	
Sustainability Studies	LDAR 226G Landscape Research Theory + Design	MLA	Required	2
	LDAR WW217 Research Methods	MLA	Required	
Hydrology / Stormwater management/drainage	LDAR 2257 Hydrological Systems	MLA	Required	1

University/Program Reviewed: **Texas A&M BLA**

Required/optional courses that cover any of the following topics:	Course name(s)	Degree level(s)	Required or Optional?	Number of courses in topic required through all years of program
Botany/Horticulture	HORT 306 Trees & Shrubs for Susainable Built Environments	BLA	Required	5
	HORT 308 Plants for Sustainable Landscapes	BLA	Required	
	LAND 211 Landscape Design I	BLA	Required	
	LAND 212 Landscape Design II	BLA	Required	
	LAND 231 Landscape Construction I	BLA	Required	
Construction Materials and methods	LAND 301 Landscape Architecture Theory	BLA	Required	8
	LAND 484 Summer Internship	BLA	Required	
	LAND 494 Internship	BLA	Required	
	LAND 312 Landscape Design IV	BLA	Required	
	LAND 412 Landscape Design VI	BLA	Required	
	LAND 210 Microclimatic Urban Design: Cool Solutions for Hot Cities	BLA	Optional	
	LAND 231 Landscape Construction I	BLA	Required	
	LAND 232 Landscape Construction II	BLA	Required	
	LAND 331 Landscape Construction III	BLA	Required	
Ecology	RENR 205 Fundamentals of Ecology	BLA	Required	8
	RENR 215 Fundamentals of Ecology --Lab 1	BLA	Required	
	LAND 240 History of Landscape Architecture	BLA	Required	
	LAND 241 History and Development of Landscape Architecture in North America	BLA	Required	
	LAND 311 Landscape Design III	BLA	Required	
	LAND 312 Landscape Design IV	BLA	Required	
	LAND 210 Microclimatic Urban Design: Cool Solutions for Hot Cities	BLA	Optional	
	LAND 231 Landscape Construction I	BLA	Required	
	LAND 232 Landscape Construction II	BLA	Required	
	URPN 325 Introduction to GIS in Urban and Regional Planning]	BLA	Optional	
Engineering	LAND 232 Landscape Construction II	BLA	Required	2
	LAND 331 Landscape Construction III	BLA	Required	
Geology	LAND 211 Landscape Design I	BLA	Required	3
	LAND 212 Landscape Design II	BLA	Required	
	LAND 312 Landscape Design IV	BLA	Required	
Hydrology	LAND 311 Landscape Design III	BLA	Required	6
	LAND 312 Landscape Design IV	BLA	Required	
	LAND 412 Landscape Design VI	BLA	Required	
	LAND 210 Microclimatic Urban Design: Cool Solutions for Hot Cities	BLA	Optional	
	LAND 231 Landscape Construction I	BLA	Required	
	LAND 232 Landscape Construction II	BLA	Required	
	LAND 331 Landscape Construction III	BLA	Required	
Mathematics	MATH 140 Math for Business & Social Science	BLA	Required	2
	MATH 142 Business Calculus	BLA	Required	
Stormwater management/drainage	LAND 311 Landscape Design III	BLA	Required	6
	LAND 312 Landscape Design IV	BLA	Required	
	LAND 412 Landscape Design VI	BLA	Required	
	LAND 210 Microclimatic Urban Design: Cool Solutions for Hot Cities	BLA	Optional	
	LAND 231 Landscape Construction I	BLA	Required	
	LAND 232 Landscape Construction II	BLA	Required	
	LAND 331 Landscape Construction III	BLA	Required	
Sustainability Studies	LAND 101 Introduction to Landscape Architectural Practice	BLA	Required	15
	LAND 240 History of Landscape Architecture	BLA	Required	
	LAND 241 History and Development of Landscape Architecture in North America	BLA	Required	
	LAND 431 Professional Practice	BLA	Required	
	LAND 111 Landscape Architecture Communications I	BLA	Required	
	LAND 112 Landscape Architectural Communications II	BLA	Required	
	LAND 211 Landscape Design I	BLA	Required	
	LAND 212 Landscape Design II	BLA	Required	
	LAND 311 Landscape Design III	BLA	Required	
	LAND 312 Landscape Design IV	BLA	Required	
	LAND 412 Landscape Design VI	BLA	Required	

	LAND 210 Microclimatic Urban Design: Cool Solutions for Hot Cities	BLA	Optional	
	LAND 231 Landscape Construction I	BLA	Required	
	LAND 232 Landscape Construction II	BLA	Required	
	URPN 220 Digital Communication I	BLA	Required	
	URPN 320 Digital Communication II	BLA	Required	
	URPN 325 Introduction to GIS in Urban and Regional Planning]	BLA	Optional	
Vehicular and pedestrian circulation/roadway alignment design	LAND 312 Landscape Design IV	BLA	Required	5
	LAND 412 Landscape Design VI	BLA	Required	
	LAND 231 Landscape Construction I	BLA	Required	
	LAND 232 Landscape Construction II	BLA	Required	
	LAND 331 Landscape Construction III	BLA	Required	

University/Program Reviewed: **Texas A&M University MLA**

Required/optional courses that cover any of the following topics:	**Course name(s)**	**Degree level(s)**	**Required or Optional?**	**Number of courses in topic required through all years of program**
Botany/Horticulture	LAND 614 Landscape Architectural Construction.	MLA	Required	3
	LAND 645 Practice Diversity in Landscape Architecture.	MLA	Required	
	HORT 608 Plants for Landscape Design	MLA	Required	
Construction Materials and methods	LAND 612 Landscape Architectural Site Engineering and Development	MLA	Required	4
	LAND 614 Landscape Architectural Construction.	MLA	Required	
	LAND 620 Open Space Development I.	MLA	Required	
	LAND 621 Open Space Development II	MLA	Required	
Ecology	LAND 614 Landscape Architectural Construction.	MLA	Required	8
	LAND 602 Landscape Architectural Design Theory and Application II	MLA	Required	
	LAND 620 Open Space Development I.	MLA	Required	
	LAND 621 Open Space Development II	MLA	Required	
	LAND 635/PLAN 635 Concepts in Ecological Planning and Design	MLA	Optional	
	LAND 693 Professional Study	MLA	Required	
	LAND 645 Practice Diversity in Landscape Architecture.	MLA	Required	
	ECCB 403 Population and Community Ecology	MLA	Required	
	HORT 608 Plants for Landscape Design	MLA	Required	
Engineering	LAND 612 Landscape Architectural Site Engineering and Development	MLA	Required	8
	LAND 614 Landscape Architectural Construction.	MLA	Required	
	LAND 602 Landscape Architectural Design Theory and Application II	MLA	Required	
	LAND 620 Open Space Development I.	MLA	Required	
	LAND 621 Open Space Development II	MLA	Required	
	LAND 640 Research Methods in Landscape Architecture.	MLA	Required	
	LAND 645 Practice Diversity in Landscape Architecture.	MLA	Required	
	LAND 646 Professional Practice.	MLA	Required	
	LAND 655 Landscape Architectural Communication.	MLA	Optional	
	PLAN 625 Geographical Information Systems in Landscape and Urban Planning,	MLA	Optional	
Geology	LAND 602 Landscape Architectural Design Theory and Application II	MLA	Required	2
	LAND 620 Open Space Development I.	MLA	Required	
Hydrology	LAND 612 Landscape Architectural Site Engineering and Development	MLA	Required	4
	LAND 614 Landscape Architectural Construction.	MLA	Required	
	LAND 602 Landscape Architectural Design Theory and Application II	MLA	Required	
	LAND 620 Open Space Development I.	MLA	Required	
Mathematics	LAND 612 Landscape Architectural Site Engineering and Development	MLA	Required	2
	LAND 614 Landscape Architectural Construction.	MLA	Required	
Stormwater management/drainage	LAND 612 Landscape Architectural Site Engineering and Development	MLA	Required	5
	LAND 614 Landscape Architectural Construction.	MLA	Required	
	LAND 602 Landscape Architectural Design Theory and Application II	MLA	Required	
	LAND 620 Open Space Development I.	MLA	Required	
	LAND 635/PLAN 635 Concepts in Ecological Planning and Design	MLA	Optional	
	LAND 645 Practice Diversity in Landscape Architecture.	MLA	Required	
Sustainability Studies	LAND 612 Landscape Architectural Site Engineering and Development	MLA	Required	10
	LAND 614 Landscape Architectural Construction.	MLA	Required	
	LAND 601 Landscape Architectural Design Theory.	MLA	Required	

	LAND 602 Landscape Architectural Design Theory and Application II	MLA	Required	
	LAND 620 Open Space Development I.	MLA	Required	
	LAND 621 Open Space Development II	MLA	Required	
	LAND 622/PLAN 622 Critical Place Studies: Theory, Research and Practice	MLA	Optional	
	LAND 632 Design for Active Living	MLA	Optional	
	LAND 635/PLAN 635 Concepts in Ecological Planning and Design	MLA	Optional	
	LAND 693 Professional Study	MLA	Required	
	LAND 603 Principles and Techniques of Land Development.	MLA	Optional	
	LAND 630 Development of Landscape Architecture	MLA	Required	
	LAND 640 Research Methods in Landscape Architecture.	MLA	Required	
	LAND 645 Practice Diversity in Landscape Architecture.	MLA	Required	
	LAND 655 Landscape Architectural Communication.	MLA	Optional	
	LAND 661 Visual Quality for Design and Planning.	MLA	Optional	
	LDEV 671 Sustainable Development	MLA	Optional	
	PLAN 625 Geographical Information Systems in Landscape and Urban Planning,	MLA	Optional	
Vehicular and Pedestrian Circulation/Roadway Alignment & Design	LAND 612 Landscape Architectural Site Engineering and Development	MLA	Required	6
	LAND 614 Landscape Architectural Construction.	MLA	Required	
	LAND 601 Landscape Architectural Design Theory.	MLA	Required	
	LAND 602 Landscape Architectural Design Theory and Application II	MLA	Required	
	LAND 620 Open Space Development I.	MLA	Required	
	LAND 621 Open Space Development II	MLA	Required	
	LAND 632 Design for Active Living	MLA	Optional	

University/Program Reviewed: **University of New Mexico**

Required/optional courses that cover any of the following topics:	Course name(s)	Degree level(s)	Required or Optional?	Number of courses in topic required through all years of program
Botany/Horticulture	Plants I + Plants II, Studios (5)	MLA	Required	7
Construction Materials and methods	Construction Materials + Methods, Studios (5)	MLA	Required	6
Ecology	Urban Ecology, Studio 502, Studio 503, Studio 504 Site + Environment	MLA	Required	5
Engineering	Grading + Drainage, History of LA, Studios	MLA	Required	5
Geology	Site + Environment, Design Studios 502, 504	MLA	Required	3
Hydrology	Grading + Drainage, Site + Environment, Studio 502	MLA	Required	3
Mathematics	Grading + Drainage, Site + Environment, Studios 502 503 504 505	MLA	Required	6
Stormwater management/drainage	Site + Environment, Design Studios 502, 504	MLA	Required	3
Sustainability Studies	Urban Ecology, Studios (5), Site + Environment, Theory	MLA	Required	7
Vehicular and pedestrian circulation/roadway alignment design	Site + Environment, Design Studios 502, 504	MLA	Required	3

University/Program Reviewed: **University of Pennsylvania MLA**

Required/optional courses that cover any of the following topics:	Course name(s)	Degree level(s)	Required or Optional?	Number of courses in topic required through all years of program
Botany/Horticulture	LARP 511 Workshop I: Ecology & Built Landscapes	MLA	Required	2
	LARP 512 Workshop II: Landform and Grading & Planting Design	MLA	Required	
	LARP 750 Topics in Construction, Horticulture, & Planting Design	MLA	Optional	
	LARP 755 Understanding Plants	MLA	Optional	
Construction Materials and methods	LARP 612 Workshop IV: Advanced Landscape Construction	MLA	Required	1
	LARP 750 Topics in Construction, Horticulture, & Planting Design	MLA	Optional	
Ecology	LARP 511 Workshop I: Ecology & Built Landscapes	MLA	Required	3
	LARP 512 Workshop II: Landform and Grading & Planting Design	MLA	Required	
	LARP 512 Workshop II: Spring Field Ecology	MLA	Required	
	LARP 761 Urban Ecology	MLA	Required	
	LARP 750 Topics in Construction, Horticulture, & Planting Design	MLA	Optional	
	LARP 760 Topics in Ecological Design	MLA	Optional	
	LARP 790/794 Natural Systems (for 3yr & 2yr students, respectively)	MLA	Required	

Engineering	LARP 611 Workshop III: Site Engineering & Water Management	MLA	Required	1
Geology	LARP 511 Workshop I: Ecology & Built Landscapes	MLA	Required	1
	LARP 512 Workshop II: Landform and Grading & Planting Design	MLA	Required	
Hydrology	LARP 511 Workshop I: Ecology & Built Landscapes	MLA	Required	1
Mathematics				
Stormwater management/drainage	LARP 611 Workshop III: Site Engineering & Water Management	MLA	Required	1
Sustainability Studies	LARP 760 Topics in Ecological Design	MLA	Optional	
Vehicular and pedestrian circulation/roadway alignment design				

University/Program Reviewed: **UW-Madison BLA**

Required/optional courses that cover any of the following topics:	**Course name(s)**	**Degree level(s)**	**Required or Optional?**	**Number of courses in topic required through all years of program**
Botany/Horticulture	Botany 130: Introduction to Botany (with lab)	BLA	Required	2
Construction Materials and methods	LA 354: Landscape Technology II	BLA	Required	1
Ecology	Bot 260: Introduction to Optionalcology	BLA	Required	2
	LA 361: Wetlands Optionalcology	MLA/BLA	Optional	
	LA 560: Plants and Optionalcology in Design	BLA	Required	
	LA 651: Plant Community Restoration Workshop	MLA/BLA	Optional	
	LA 668: Restoration Optionalcology	MLA/BLA	Optional	
Engineering	Mech Optionalng 160: Architectural Graphics;	BLA	Optional	
	Bio Systems Optionalng 201: Land Surveying Fundaments	BLA	Optional	
Geology	Geog 127: Physical Systems of the Optionalnvironment	BLA	Optional	1
Hydrology				
Mathematics	Gen Optional	BLA	Required	1
Stormwater management/drainage	LA 353: Landcape Technology I	BLA	Required	1
Sustainability Studies	LA 563: Designing Sustainable and Resiliant Regions	BLA	Required	1
Vehicular and pedestrian circulation/roadway alignment design				

University/Program Reviewed: **Utah State University**

Required/optional courses that cover any of the following topics:	**Course name(s)**	**Degree level(s)**	**Required or Optional?**	**Number of courses in topic required through all years of program (BLA)**	**Number of courses in topic required through all years of program (MLA)**
Botany/Horticulture	PSC 2620 Woody Plants	BLA	Required	2	0
	LAEP 3500 Planting Design	BLA	Required		
Construction Materials and methods	LAEP 2600 Landscape Construction	BLA, MLA	Required	3	1
	LAEP 4110 Landscape Construction II	BLA	Required		
	LAEP 3600 Landscape Materials	BLA	Required		
Ecology	WILD 2200 Ecology	BLA	Required	1	1
	LAEP 6110 Landscape Ecology	MLA	Required		
Engineering				0	0
Geology	Physical Sciences	BLA	Required	1	0
Hydrology				0	0
Mathematics	Math 1050	BLA	Required	1	0
Stormwater management/drainage	LAEP 2600 Landscape Construction	BLA, MLA	Required	1	1
Sustainability Studies				0	0
Vehicular and pedestrian circulation/roadway alignment design	LAEP 2720 Analysis & Design II	BLA, MLA	Required	1	1

American Society of
Landscape Architects

Fig. 1

Landscape Architecture and Science, Technology, Engineering, and Mathematics (STEM): Case Studies

2020

ASLA Committee on Education

Landscape Architecture and Science, Technology, Engineering, and Mathematics (STEM): Case Studies

Landscape architecture is inherently a Science, Technology, Engineering, and Mathematics (STEM) discipline. The principles of STEM constitute the foundation of the academic criteria and professional practice of landscape architecture. Through stewardship of the natural and built environments, landscape architects routinely apply their STEM education and training to plan and design vital infrastructure projects, rights-of-way, campuses and other significant private and public site developments—all places where millions of people live, work, and play.

The technical complexity of landscape architecture and its impact on public health, safety, and welfare has led all 50 states and the District of Columbia to license landscape architects. Ensuring public health, safety, and welfare in the practice of landscape architecture starts with a rigorous STEM higher education, and culminates in a nationally administered four-part examination, the Landscape Architecture Registration Exam (LARE).

Landscape architecture students are educated, trained, and tested on site design; land planning; technical and scientific areas such as grading; drainage; stormwater management; horticulture; environmental sciences; project development; erosion control; hydrology; irrigation; vehicular and pedestrian circulation; roadway alignment design; manipulation of contours and spot elevations; calculations of slopes, grades, and volumes of material; design of surface and subsurface storm drainage, including hydraulic characteristics and storm drain connections; and site planning for buildings and other structures. Clearly, the academic curriculum for landscape architecture encompasses science, technology, mathematics, and certain engineering courses of study.

Landscape architects rely on STEM knowledge areas, activities, and disciplines as fundamental components of their professional practice. The profession plans and designs all the spaces outside buildings, including community master plans, multimodal transportation networks, transit-oriented development projects, outdoor park and recreation spaces, water and stormwater management projects, and more. For these and many other landscape architecture projects, practitioners apply the science of statics, ecology, and physics for site planning, the technology of state of the art digital simulation tools like GIS, LiDAR, and others, the engineering skills and knowledge of landform manipulation and stormwater management to design and engineer roads, walkways, and drainage structures and mathematical computations for slope, grades, and structural loads—all with an eye toward public health and safety. STEM subject areas are clearly the driving forces behind both the rationale and execution of the landscape architecture projects.

STEM subject matters are intrinsically a part of both the academic discipline and practice of landscape architecture and is recognized as such by individuals, other professionals, academic institutions, and governing bodies. The Bureau of Labor Statistics Standard Occupational Classification (SOC) System has recognized landscape architecture as a science and engineering related domain.[1] This system is used by the federal government to classify workers into occupational categories, grouping together occupations with similar job duties, and in some cases, skills, education, and/or training are grouped together. Under this system, landscape architecture is grouped with civil engineers, architectural and civil drafters, environmental engineers, and surveyors. Several states formally define landscape architecture as a STEM discipline. For example, the Departments of Labor in both New York and Connecticut recognize landscape architecture as a STEM profession. The State of Florida recognizes landscape architecture as a STEM degree program through the Board of Governors' State University System's list of "Programs of Strategic Emphasis."[2]

However, there are some entities that have not formally recognized landscape architecture as a STEM discipline, including the U.S. Department of Homeland Security (DHS) Science, Technology, Engineering, and Mathematics (STEM) Designated Degree Program List. Through advocacy, communication, and research, the American Society of Landscape Architects (ASLA) is working to raise the visibility of the profession's innate STEM qualities and practice areas with federal, state, and local stakeholders, the STEM community, and the general public. To learn more about ASLA's efforts visit www.asla.org/STEM.

[1] https://www.bls.gov/soc/2018/major_groups.htm#17-0000

[2] https://www.flbog.edu/wp-content/uploads/Fall-2020-Approved-PSE-List-All-Categories-2-4-20.pdf

The following thirteen landscape architecture projects are case studies that demonstrate how STEM practice areas are comprehensively employed throughout the project and through its successful completion. Each case study also includes an evaluation of the degree to which various STEM areas are employed. The projects, which were all led by landscape architects, also demonstrate some of the breadth and scope of the profession, from urban planning, to shoreline protection, to large-scale waterfront projects, to green roofs, to university campus planning and design, to community parks, and other public spaces.

Landscape Architecture Professional Projects and STEM Criteria

STEM Project Matrix

	Anacostia Watershed	Shield Ranch	Living Breakwaters	Galveston Island State Park	Crosswinds Marsh	Seattle Waterfront Project	U. of Wisconsin-Madison	Baton Rouge Lakes	Gathering Place	Railroad Park	Gary Comer Youth Center	ASLA Roof Garden	Millennium Park
Science													
Ecology, Evolution, and Population Biology	●	●	●	●	●	●	●	●	●	●	◑	◑	●
Physical Sciences	●	●	◑	●	●	●	●	●	●	●	●	●	●
Physiology, Pathology, and Toxicology	●	○	●	○	◑	○	◑	●	○	○	○	○	●
Social and Cultural Sciences	●	●	●	●	●	●	●	◑	◑	●	●	●	●
Technology													
Stormwater Infrastructure	●	●	●	●	●	●	●	●	●	●	●	●	●
Multi-Modal Transportation	●	○	○	○	●	●	●	○	◑	◑	○	○	●
Sustainable SITES Initiative	○	○	●	○	○	◑	○	●	◑	◑	◑	◑	◑
Food and Agriculture	○	○	●	○	○	◑	○	○	○	○	●	○	○
Interactive	●	●	●	●	●	●	●	○	●	●	●	●	●
Computer Programming and Planning	●	●	◑	●	●	●	●	●	◑	●	○	◑	●
Educational/Instructional	●	●	●	●	●	●	●	●	●	●	●	●	●
Planning and Inventory	●	●	●	◑	●	●	●	●	●	●	○	●	●
Engineering													
Structure and Capacity	◑	◑	◑	●	○	●	◑	●	●	●	●	●	●
Materials and Joints	○	○	○	○	◑	●	◑	●	●	○	●	◑	◑
Codes and Regulations	◑	◑	●	◑	○	●	◑	◑	●	◑	●	◑	●
Construction Documents and Specifications	◑	○	◑	○	◑	●	◑	◑	●	◑	●	◑	●
Water and Climate Performances	●	●	●	●	●	●	●	●	●	●	●	●	●
Mathematics													
Grading and Earthworks	●	◑	●	●	●	●	○	●	●	●	◑	◑	●
Project Cost Estimates	●	○	◑	○	●	◑	◑	◑	○	○	◑	◑	●
Biomathematics	●	●	●	●	●	◑	◑	●	◑	●	●	●	◑
Stormwater Planning and Management	●	●	●	●	●	●	●	●	●	●	●	●	●
Structural Loads	●	◑	◑	◑	○	●	◑	●	●	●	●	●	●
Urban Modeling	●	●	●	●	◑	◑	●	●	◑	○	○	●	◑

● Highly relevant
◑ Moderately relevant
○ Mildly relevant

Project No. 1: Anacostia Watershed

NBBJ, Landscape Architecture and Urban Planning, Boston, MA

Fig. 2 Site remediation projects identified along the Anacostia River. Image courtesy of Anacostia Waterfront Trust.

Site Location:	Maryland and Washington, D.C.
Project Type:	River Restoration/Water Sanitation
Scope:	Watershed Restoration
Size:	176 square miles
Date:	2023
Cost:	$2.7 billion
Recognition:	
Citations:	Reut, Jennifer. “The River Beneath the River.” *Landscape Architecture Magazine* 108 (2018) https://landscapearchitecturemagazine.org/2018/11/27/the-river-beneath-the-river/
Prime Firm:	NBBJ, Boston, MA
Federal Departments:	DC Office of Planning, Department of Energy & Environment, DC Water, Justice Department
Engineer:	WSP, Baltimore, MD
Advocate Groups:	Anacostia Waterfront Trust, Anacostia Watershed Society, Anacostia Watershed Restoration Partnership, Anacostia River Keepers

Fig. 3 The tidal flow of the river leaves pollutants on the banks. Photo by Krista Schlyer.

Fig. 4 Charismatic boring machine used to dig tunnel below Anacostia River. Image courtesy of DC Water.

Anacostia Watershed, Continued

Project Brief:
This large scale project originated in Washington, D.C. as “The Anacostia Waterfront Framework Plan,” which recognized the need to transform the health of the Anacostia River. Through collaboration between NBBJ, the DC Office of Planning, the Anacostia Watershed Society, the EPA, and the Justice Department, a new “Clean River Project” began with DC Water focusing on Combined Sewer Overflow (CSO) challenges. To address these issues, DC Water initially built innovative tunnels to transport water beneath the river to the Blue Plains Advanced Wastewater Treatment Plant. Once the water is processed, it is released back into the Potomac and flows towards the Chesapeake Bay. Additional green infrastructure methods were implemented by Seth Charde, the landscape architect and project manager for DC Water. The Clean River Project will reduce storm-water volume in the rivers by 96 percent, compensating for 250 years of neglect. There are still other measures to be taken, specifically cleaning up sediment pollution from legacy industries, with the aim of improving human recreation and bringing in new sources of revenue along the Anacostia waterfront.

Science:
Projects along the waterfront used green infrastructure and bio-retention methods to filter water along the shore of the river. These natural best-management practices use plants to trap particles from the water before flowing down stream.

Rehabilitation efforts are underway to lessen the effect of toxic mudflats, and the restored wetlands have increased biodiversity and habitat for species.

Technology:
The newly built wastewater treatment facility processes storm and sewage water before returning it to the natural hydrological system.

DC Water is using new trash skimming boats to remove pollution from the river. This efficient technology quickly restores the water to a healthy state through the timely extraction of trash and litter.

Engineering:
To stop the historic flow of untreated water entering the river, DC Water built a tunnel to separate and move the water so it does not contaminate the river. The gravity-fed tunnel transports sewage to be treated at Blue Plains Advanced Wastewater Treatment Plant. Construction of the tunnel amends for years of mismanaged water.

Mathematics:
The new efficient tunnel prevents 170 million gallons of stormwater and sewage from entering the Anacostia River in one storm event.

Water quality testing serves to examine the health of the river, testing for E. Coli and fecal bacteria. Additional water quality tests for dissolved oxygen, pH, chlorophyll, depth, and turbidity are done regularly to monitor and analyze the health of the river.

Project No. 2: Shield Ranch

Andropogon Associates, Ltd., Landscape Architecture, Philadelphia, PA

Fig. 5 Aerial view of Shield Ranch. Photo by Jonathan Jackson.

Site Location:	Austin, TX
Project Type:	Landscape Architecture Analysis
Scope:	Analysis and Prevention
Size:	6,800 acres
Date:	2018
Cost:	
Recognition:	2018 ASLA Professional Award
Citations:	“From Pixels to Stewardship; Advancing Conservation through Digital Innovation”. American Society of Landscape Architects. www.asla.org/2018awards/453745-From_Pixels_To_Stewardship.html

Prime Firm:	Andropogon Associates, Ltd., Philadelphia, PA
Consultants:	Shield Ranch Staff, Austin, TX
Regenerative Design:	Heather Venhaus, ASLA
Biohabitats:	Claudia Browne
	Erin English, PE, LEED AP
Consulting Geologist:	Dr. Charles Woodruff
Mechanical Estimator:	Blair Tennant, LEED AP
Spot Inquiry:	Alexis Sanford
Drone Imagery:	Johnathan Jackson
Sound Consultant:	Dr. Michael Mandel

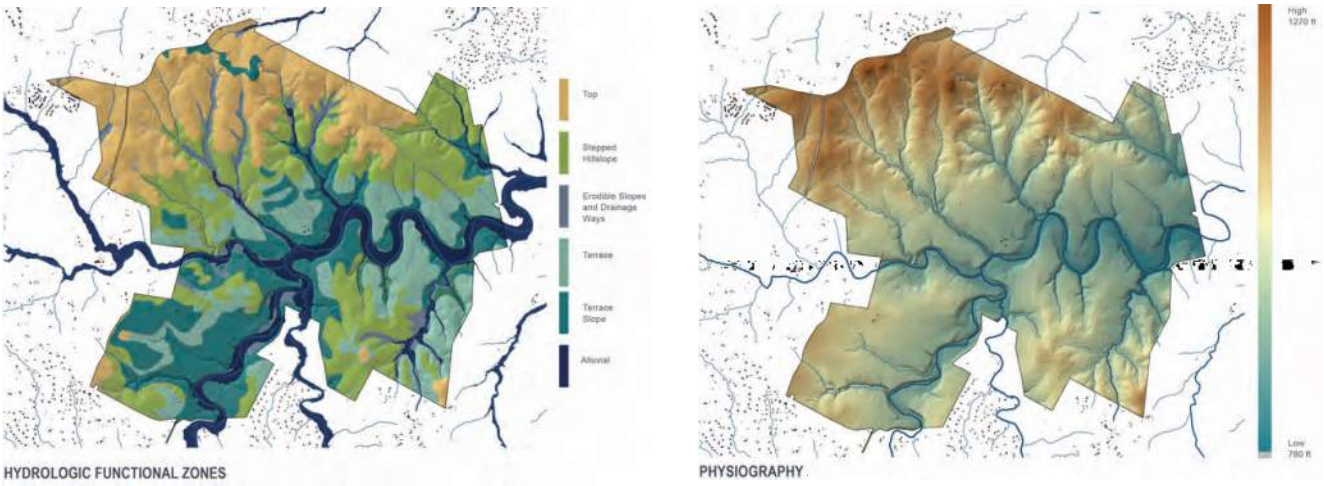


Fig. 6 Hydrologic functional zones and physiography mapped through GIS and characterized by water movement typology. Image courtesy of Andropogon Associates.

Shield Ranch, Continued

Project Brief:
Shield Ranch, a 6,800-acre compound in Austin, Texas, has been under ownership for the past 80 years by the Shield-Ayres-Bowen Family. In 1998, the family enhanced its long-term commitment to land stewardship and advocacy by placing 95% of its land under conservation easement. Protection of water quality, water quantity, and sensitive habitats was heightened further with the completion of the Shield Ranch Master Plan in 2018. The 10-year master plan integrated a pioneering process for modeling and categorizing the iconic landscape's complex natural and cultural systems, with a consensus-building process for distilling long-term development and management priorities.

Science:
The location of the ranch is in an area of extremely sensitive climatic and hydrological conditions. An in-depth inventory of the geologic, hydrologic, and topographic features of the ranch; its flora and fauna; and its prehistoric and historic cultural resources, was completed in service of a vision for sustainble land management.

The nature sanctuary preserves the ecological health of complex systems, including the protection of two endangered avian species.

Technology:
Mapping in GIS has characterized typologies of water movement to identify hydrogeologically-sensitive landscapes. These maps depict anticipated floodplains, steep slopes, risers, boundaries between geologic formations, and soils at risk for erosion. GIS has also been integrated with smartphone technology to develop a collective knowledge of scientist’s findings, site analysis, field research, and family history towards the development of a comprehensive assessment of the ranch‘s future integrity.

LiDAR technology was used to receive high-resolution point-cloud data to model topography and vegetation, constructing a model to analyze water movement in complex geologies, the diverse landscapes, ecological communities, viewsheds, and soundscapes.

Engineering:
Creating a hydrogeological model identified the dynamics and conditions of a stepped hillslope. Hydrogeology is critical for vegetation, water quality, habitat, and maintaining the health for the entire region.

Site development guidelines, per each hydrogeologic zone, focus on water management, vegetation, and land-use in order to design strategies to protect ecological systems. Storm-water best management practices are used to ensure hydrological health and proper erosion control. Practices include net-positive water building systems, bioswales, riser protection and conservation, and permeable pavements.

Mathematics:
The Barton Creek watershed drains into the Edwards Aquifer recharge zone, and Shield Ranch lies within the Barton Creek watershed. The Edwards Aquifer recharge zone is calculated to supply more than two million people with drinking water. The recharge zone bears the impacts of surrounding land holdings’ water quality, including the property of Shield Ranch.

Through measuring quantitative data on the interconnectivity of systems, humans and species, the Shield Ranch Master Plan provides long-term intervention, minimizing environmental threats in this harsh climate.

Project No. 3: Living Breakwaters

Scape Studio, Landscape Architecture, New York, NY

Fig. 7 Section of proposed living breakwater coastal condition. Image courtesy of Scape Studio.

Site Location:	South Shore Staten Island & Raritan Bay, NY
Project Type:	U.S. Department of Housing & Urban Development's Rebuild by Design Initiative
Scope:	Professional Research Competition Proposal (Phase 1 funding $60 million)
Date:	2014 - Current
Cost:	$60 million of CDBG-DR funding
Recognition:	2014 HUD Rebuild by Design Winner 2014 Fuller Challenge Winner 2015 National Planning Achievement Award for Environmental Planning 2015 ACEC NY Engineering Excellence Award
Citations:	"Living Breakwaters Rebuild by Design Competition." Scape Studio. https://www.scapestudio.com/projects/living-breakwaters-competition/

Prime Firm:	Scape Studio, Landscape Architecture, New York, NY
Architect:	LOT-EK, New York, NY
Engineering Consultant:	Parsons Brinckerhoff, New York, NY
Hydrology Consultant:	Stevens Institute of Technology, Hoboken, NJ
Engineering Consultant:	Ocean & Coastal Consultants, a COWI Co., Trumbull, CT
Marine Consultant:	SeArc Ecological Consulting, Tel-Aviv, Israel
Design Consultant:	MTWTF, New York, NY
Community:	The New York Harbor School, New York, NY

Fig. 8 Building ecological resiliency through structural, ecological and water management systems. Image courtesy of Scape Studio.

Living Breakwaters, Continued

Project Brief:
In response to Hurricane Sandy in 2012, as part of a global competition, Scape Studio's Living Breakwater design became one of six winning proposals submitted to the U.S. Department of Housing and Urban Development's Rebuild by Design Initiative. The project is focused on designing resilient solutions to threatening coastal conditions by establishing living infrastructure barriers. Off the coast of Staten Island, in Raritan Bay, work has begun to repair the damaged shoreline, bringing back a healthy ecosystem through nature-inspired barrier islands that protect the New York area from future coastal storms. The newly designed barriers combine built and natural solutions by merging specially-designed textured concrete blocks with living oysters; the newly built reefs slow the wave action and provide habitat for marine species to move in. Over time, the built reefs blend into the natural aquatic ecosystem while continuing to buffer a prized coastline from storm surges and erosion. The scope of the project serves as a global example of coastal management, integrating community involvement as local students participate in the oyster project.

Science:
The living reef infrastructure is the design of micro-pocket habitats of rocky sloped walls that provide texture for marine growth that are able to host species such as finfish, shellfish, and lobsters. The new habitats are populated by oyster communities that add structural integrity to the built reef; the oysters also act as clean water filters and provide habitat for biodiversity.

The implementation of Phase 1, the Tottenville Reach, has been used to study ecological benefits and wave-reduction impacts to establish performance before the rest of the project is fully activated.

Technology:
Hydrodynamic modeling provides storm surge data to prepare for wave action in storm events, allowing for accurate identification of new built breakwater locations that protect communities and support existing wetlands.

The design proposes interactive wet laboratory space, flexible gathering space for local community groups, bird-watching stations, and an area for citizen science observational input.

Engineering:
The proposal demonstrates how engineered living infrastructure can be constructed to reach optimal structural integrity and functional performance.

The engineered interventions propose a model that is designed to work with natural energy, while dissipating its damaging effects.

Mathematics:
The project proposes a mix of subtidal breakwater beds of differing forms that extend above the high water line. The design proposal was calculated to provide a four-foot reduction in wave height.

To understand how and where the proposal can most effectively protect communities, model breakwater systems were analyzed at the macro scale. This information is being used to design for and mitigate 100- and 500-year storm surge metrics.

Project No. 4: Galveston Island State Park

Studio Outside, Landscape Architecture and Urban Design, Dallas, TX

Fig. 9 Galveston Island State Park is the only location on Galveston Island with natural bay-to-beach accessible island habitat. Image courtesy of Studio Outside.

Site Location:	Galveston, TX
Project Type:	Resiliency Planning
Scope:	Analysis & Planning
Size:	2,000 acres
Date:	2010
Cost:	$750,000
Recognition:	2017 ASLA Professional Award
Citations:	"Storm + Sand + Sea + Strand." American Society of Landscape Architects. https://www.asla.org/2017awards/324291.html

Prime Firm:	Studio Outside, Dallas, TX
Lead Designer:	Michael Fraze, ASLA
Ecological & Coastal Resiliency Planning:	Biohabitats, Inc., Baltimore, MD
Architecture:	Overland Partners Architects, San Antonio, TX
Interpretive Planning:	PRD Group, Chantilly, VA
Hurricane Engineering:	Engenesis, North Sydney, Australia
Civil Engineering & Environmental Permitting:	CP&Y, Longview, TX
Public Engagement:	RJ Rivera Inc., San Antonio, TX
Archaeology:	Prewitt Associates, Austin, TX
Electrical Engineering & Sustainability:	Henderson Engineering, Dallas, TX

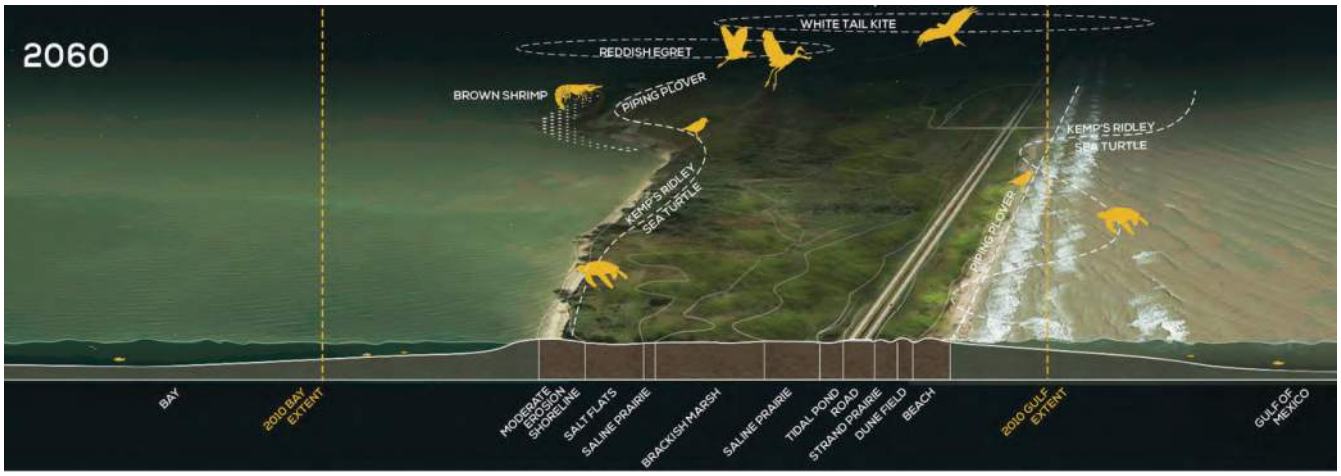


Fig. 10 Predictive modeling and ecological analysis depict the changes on the site by 2060. Image courtesy of Studio Outside

Galveston Island State Park, Continued

Project Brief:
Galveston Island State Park covers 2,000 acres of coastline in Galveston, Texas. In response to Hurricane Ike's devastation in 2008, and the previous history of 50 hurricanes impacting the Gulf communities, the redevelopment master plan sets a new precedent for coastal resiliency. Planning with predictive models depicts site strategies for specific ecologies and elevations, anticipating what will remain in 50 or 100 years, and how ecolo-gy systems will adapt to change. With the predictive models, the master plan uses this fragile and diverse landscape to fully immerse visitors in the overall experience and understanding of Galveston Island State Park, while simultaneously mitigating the impacts of an evolving landscape.

Science:
Endangered species are protected through site strategies which decrease habitat fragmentation, allowing delicate systems to evolve and flourish. The fragility of the island system led to the planning strategy, and this precedent can be adapted to other coastal resiliency projects. One strategy utilized is the reduction of impermeable surfaces by 25 percent across the park.

Overnight and recreation opportunities celebrate the diversity of the island's unique environment, integrating human systems. This broad array of recreation and integration responds to an outreach process which sought to engage hurricane-displaced residents in the development of the park.

Technology:
Field measurements from a nearby barrier island create a framework for thriving ecologies as a case study of chemical balance and resiliency to instill success at Galveston Island State Park.

Tropical-storm dynamics were assessed through storm science technology, with the State Park's topography and storm frequency predictions were modeled to understand the level and damage of storm surges.

Engineering:
Predictive modeling was used to further understand the potential landloss for 2060, to inform the master plan. Topography grading was surveyed with models studying three scenarios: the impact of sea-level rise, beach erosion, and subsidence.

On-site infrastructure was proposed to withstand the impacts of sea-level rise and storm surge, and to minimize costly damage. These structures serve as both species habitats and recreational and educational zones for visitors.

Mathematics:
Storm surges were calculated to reproduce 11 years of damage in just one day, and measurements were taken to understand the severity of such a storm surge. A 20+ foot storm surge changes the ecosystem from freshwa-ter ponds to saltwater, and this ecological change can involve years of remediation to reverse.

Percentage calculations reveal the damage of predictive sea-level rise in order to create the master plan site strategy. Site-specific results disclose a prediction of high, medium and low calculations of land loss. Based on the results, the master plan strategizes around the mid-range scenario of a 22% landloss for 2060, turning much of the land into open water or marsh.

Project No. 5: Crosswinds Marsh Wetland Interpretive Preserve

SmithGroup, Landscape Architecture, Detroit, MI

Fig. 11 SmithGroup's illustrative master plan. Image courtesy of SmithGroup

Site Location:	New Boston, MI		
Project Type:	Wetland Preserve and Restoration	**Prime Firm:**	SmithGroup, Ann Arbor, MI
Scope:	Ecological	**Civil Engineer:**	SmithGroup, Ann Arbor, MI
Size:	1,050 acres	**Environmental Engineer:**	Tucker, Young, Jackson, Tull
Date:	1995	**Architecture:**	Lincoln Poley, AIA, Ann Arbor, MI
Cost:	$18.1 million		
Recognition:	2001 The Waterfront Center Honor Award 2000 U.S. Department of Transportation Design Merit Award 1999 ASLA Presidents Award of Excellence 1999 Airports Council International Environmental Achievement Award 1998 ASLA Honor Award	**Contractors:**	ABC Paving; W.H. Canon, Inc.; and L. Lawyer Construction
Citations:	"Crosswinds Marsh Interpretative Preserve." SmithGroup. https://www.smithgroup.com/projects/crosswinds-marsh-interpretive-preserve		

Fig. 12 Before and After images showing the transformation of the historical wetland habitat. Image courtesy of SmithGroup.

Crosswinds Marsh, Continued

Project Brief:
Crosswinds Marsh is a 1,050-acre recreational park and wildlife refuge created for Detroit Metropolitan Wayne County Airport in New Boston, Michigan, one of the largest self-sustaining wetland mitigation projects in the country. When the airport expanded, the park was designed in response to environmental regulations. The new park far exceeded the necessary requirements by addressing flood protection, habitat creation, preservation, and restoration while also providing recreational, educational, and social value. Crosswinds Marsh serves as a national benchmark for ecological restoration and environmental design.

Science:
This landscape has restored over 1,000 acres of land that was previously drained for agricultural and residential use. The land has been returned to its historical wetland habitat.

Crosswinds Marsh now provides a diverse series of wetland habitats. The habitats include forested, wet meadow, emergent, submergent, and deep water areas. With its restored and preserved wetland systems, Crosswinds Marsh creates habitat for a variety of native flora and fauna.

Technology:
Monitoring data is used to identify various species on the land since restoration. Over 200 species of birds, 170 species of plants, 20 fish, 30 mammals, 21 reptiles and amphibians, and 70 species of butterflies and dragonflies have been recorded.

Scientists use the site to monitor and collect data for ongoing research and future restoration activities. They also study revegetation strategies, as well as construction and implementation methods

Engineering:
With careful and purposeful grading, the maintenance of natural systems is sculpted to follow site hydrology. The technical design considered pump-free hydrologic functions of the site to provide essential habitats that attract hundreds of animal species. As a result, Crosswinds Marsh requires no pumps, dykes, or artificial methods for directing water throughout the site.

The site decreased downstream and upstream flooding through grading and wetland implementation.

Mathematics:
In order to create self-sustaining wetland communities, quantitative data calculated over 300,000 native aquatic plants, with 10,000 seedlings and 300 acres of wetland seed added to the site.

Sensitive planning revealed the necessary area needed to protect threatened species. Limited access was given to 20 acres for the propagation and re-establishment of three rare plant species relocated from the airport. Bald eagle nesting sites are also preserved on the site.

Project No. 6: Seattle Waterfront

James Corner Field Operations, Landscape Architecture, New York, NY

Fig. 13 Plan of the new pedestrian-focused Central Waterfront on Alaskan Way. Image courtesy of James Corner Field Operations.

Site Location:	Seattle, WA
Project Type:	Landscape Architecture/Urban Design/Seawall Infrastructure
Scope:	Ecological Waterfront and Pedestrian Promenade 1.5 miles
Size:	2017 - 2023
Date:	$717 million
Cost:	2017 ASLA Professional Awards, General Design
Recognition:	“Central Seawall Project.” American Society of Landscape Architects.
Citations:	https://www.asla.org/2017awards/320768.html “Seattle Central Waterfront.” James Corner Field Operations. https://www.fieldopera-tions.net/project-details/project/seat-tle-central-waterfront.html

Prime Firm:	Parsons Corporation, Pasadena, CA
Landscape Architect:	James Corner Field Operations, New York, NY
Lead Engineer:	Magnusson Klemencic Associates, Seattle, WA
Civil Engineer:	Perteet, Seattle, WA
Civil Engineer:	SvR, Seattle, WA
Coastal Engineer:	Moffatt & Nichol, Seattle, WA
Structural Engineer:	COWI North America
Structural Engineer:	Exeltech Consulting, Inc., Seattle, WA
Geo-technical Engineer:	Shannon & Wilson, Inc.
Habitat Engineer	Hart Crowser
Local Landscape Architect:	Harrison Design Landscape Architecture, Seattle, WA
Artist:	Hadd/Drugan, Laura Haddad
Construction Management:	Jacobs Engineering Group Inc., New York, NY

Fig. 14 Rendering of the new Seattle Central Waterfront after removal of the Alaskan Way Viaduct. Image courtesy of James Corner Field Operations.

Seattle Waterfront, Continued

Project Brief:
With the removal of the Alaskan Way Viaduct and the reconstruction of the 75-year-old Elliot Bay Seawall, the City of Seattle is preparing to reactivate its Central Waterfront and reconnect to Elliott Bay. The comprehensive urban design framework along the 1.5 miles of waterfront has been led by the landscape architecture firm Field Operations. The multiple scale plan considers the geographic and cultural concerns of the region by prioritizing the native salmon runs and the frequency of earthquakes in Seattle. The new seawall enhances the public realm with its elevation, providing connections to downtown with new waterfront access points. The structure of the seawall is designed to withstand seismic events, with the wall also featuring a texture to encourage healthy ecological conditions, and cantilevered surfaces containing embedded light-transferring glass for aquatic life to return and flourish. The-six year infrastructure project addresses the many needs of the city and seizes the opportunity to reintroduce natural systems through the implementation of design.

Science:
Habitat restoration on the seawall is created through shallow habitat shelves for increased biodiversity. This improves salmon migration and near-shore conditions by providing vertical textured surfaces for biotic growth and channels for safe travel of juvenile fish.

Lower gravel surfaces of the raised seabed provide aquatic life areas to hide and forage within the varied surface. With vegetation and marine invertebrate growth, water quality continues to improve.

Technology:
Permeable paving materials are used on ground surfaces to allow for natural water movement to recharge groundwater and mitigate storm-water runoff.

The built cantilever infrastructure over the Puget Sound transfers daylight to the biotic life below the public pedestrian walkway.

Engineering:
A boring machine was used to dig the tunnel under the City of Seattle to re-route the Alaskan Way Viaduct below the city, which necessitated the revised ground level street connections that incorporate bike and pedestrian traffic.

The weakening seawall was replaced to protect the coastal city from impending damage and stormwater events.

Mathematics:
The new seawall meets the seismic standards with oversight from the City of Seattle and NEHRP. The seawall was designed to maintain the vital edge of the city and last a minimum of 75 years.

Project No. 7: University of Wisconsin-Madison Campus

SmithGroup, Architecture & Landscape Architecture, Detroit, MI

Fig. 15 The University of Wisconsin-Madison campus connects Madison to Lake Mendota. Image courtesy of SmithGroup.

Site Location:	Madison, WI
Project Type:	Higher Education Master Plan
Scope:	Stormwater Management & Restoration
Size:	936 acres
Date:	2015
Cost:	
Recognition:	2017 SCUP Excellence in Landscape Architecture - Open Space Planning and Design 2018 ASLA Award of Excellence - Analysis and Planning ASLA-Michigan, Honor Award
Citations:	“University of Wisconsin-Madison Master Plan.: SmithGroup. https://www.smithgroup.com/projects/university-of-wisconsin-madison-master-plan

Prime Firm:	SmithGroup, Ann Arbor, MI
Landscape Architect:	Hoerr Schaudt, Chicago, IL
Engineering Consultants:	Kimley-Horn and Associates, Raleigh, NC

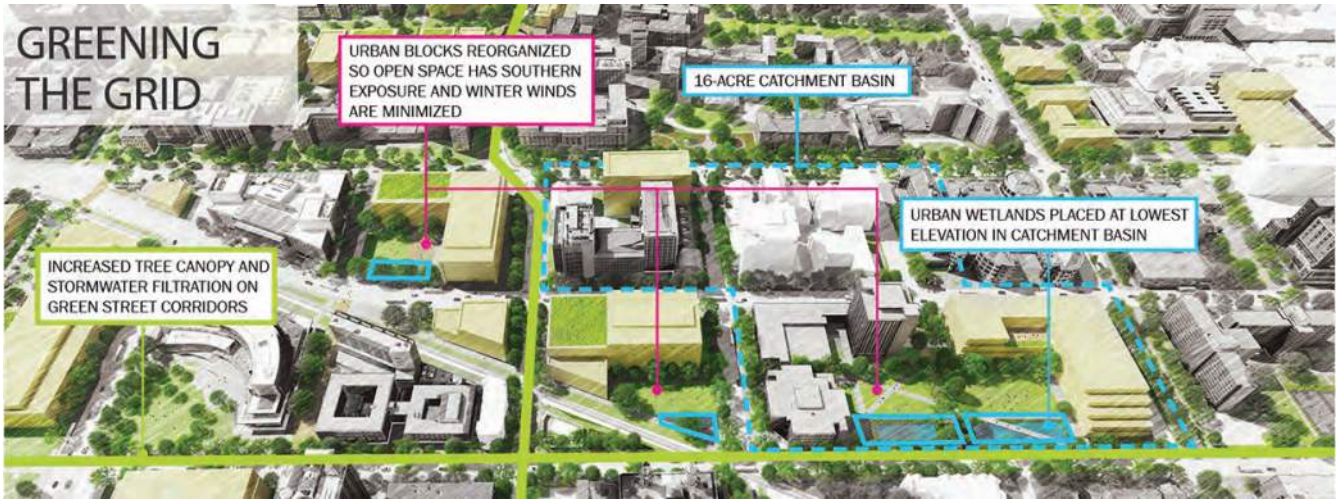


Fig. 16 Green infrastructure throughout the campus provides productive and sustainable landscapes. Image courtesy of SmithGroup.

University of Wisconsin-Madison Campus, Continued

Project Brief:
The University of Wisconsin-Madison, located in Madison, Wisconsin, was founded in 1848 and is the state's oldest and largest university. The university's 936 acres and 4.5 miles of shoreline on Lake Mendota serve as a connection between the lake and the city of Madison. The university's Campus Master Plan Update recognizes the future health of the campus and the lake and is the first landscape-focused master plan in university history. Historic and culturally rich landscapes are connected through a more traditional campus plan merged with a performance-based green infrastructure approach. The university's innovative plan serves as a precedent for other institutions with its measurable improvements in stormwater management and water quality. The Campus Master Plan sets a new national standard for university planning with integrative design between public and performance landscapes.

Science:
New state and federal water quality regulations require significant regional reductions in Total Maximum Daily Load Regulations. Total Suspended Solids (TSS) are required to be reduced by 73 percent and Total Phosphorus is required to be reduced by 61percent. The campus planning process analyzed the interconnectivity of water systems in order to identify partnerships needed to achieve these percentages.

To protect Lake Mendota, conversions were made to Observatory Hill to protect habitat and improve water quality. The existing slope remains with the removal of a parking lot and the addition of a wetland system.

Technology:
Technical analysis was conducted using Geographic Information Systems (GIS) and various stormwater modeling programs to develop comprehensive watershed studies, including studies on Lake Mendota Watershed, Lake Monona Watershed, and Willow Creek Sub-watershed. The analysis reveals that 2,000 acres of upstream city stormwater flows through Willow Creek, which runs through the University of Wisconsin-Madison campus.

The existing campus green infrastructure was modeled to quantify the runoff reduction benefits in order to establish an effective baseline for plan recommendations.

Engineering:
The University of Wisconsin-Madison integrated landscape with stormwater management plans, making it one of the first institutions to combine landscape productivity into the larger campus master planning. Stormwater management will help the campus contribute to achieving the standards set by the state and federal water quality regulations.

To increase landscape performance while designing public space the team increased tree canopy and stormwater filtration on green street corridors, added catchment basins, reorganized urban blocks to shield winter winds, and placed urban wetlands at the lowest elevation in a catchment basin. The landscape infrastructure, green streets, and catchment basins drastically reduce the TSS conditions on campus.

Mathematics:
Quantified analysis reveals how the existing campus landscapes and infrastructures contribute to TSS reduction. Landscape improvements were then modeled and quantified for measurable performance, with the new campus plan estimated to capture 30,900 pounds of TSS per year, reducing the on-campus TSS by 45%.

Project No. 8: Baton Rouge Lakes

SWA Group, Landscape Architecture, Urban Design and Planning, Houston, TX

Fig. 17 Rendering of the Baton Rouge Lakes after restoration. Image courtesy of SWA Group.

Site Location:	Baton Rouge, LA
Project Type:	Restoration
Scope:	Analysis & Planning
Size:	275 acres
Date:	2016
Cost:	$100 million
Recognition:	2016 ASLA Professional Award
Citations:	“Baton Rouge Lakes: Restoring a Louisiana Landmark from Ecological Collpase to Cultural Sanctuary.” American Sociaety of Landscape Architects. https://www.as-la.org/2016awards/172896.html
Prime Firm:	SWA Group
Consultants:	CARBO Landscape Architecture, Baton Rouge, LA
Outreach Plan:	Center for Planning Excellence, Baton Rouge, LA
Restoration Team:	Biohabitats, Baltimore, MD
Management Consultants:	Pros Consulting, Indianapolis, IN
Engineering Services:	Stantec, Edmonton, Canada

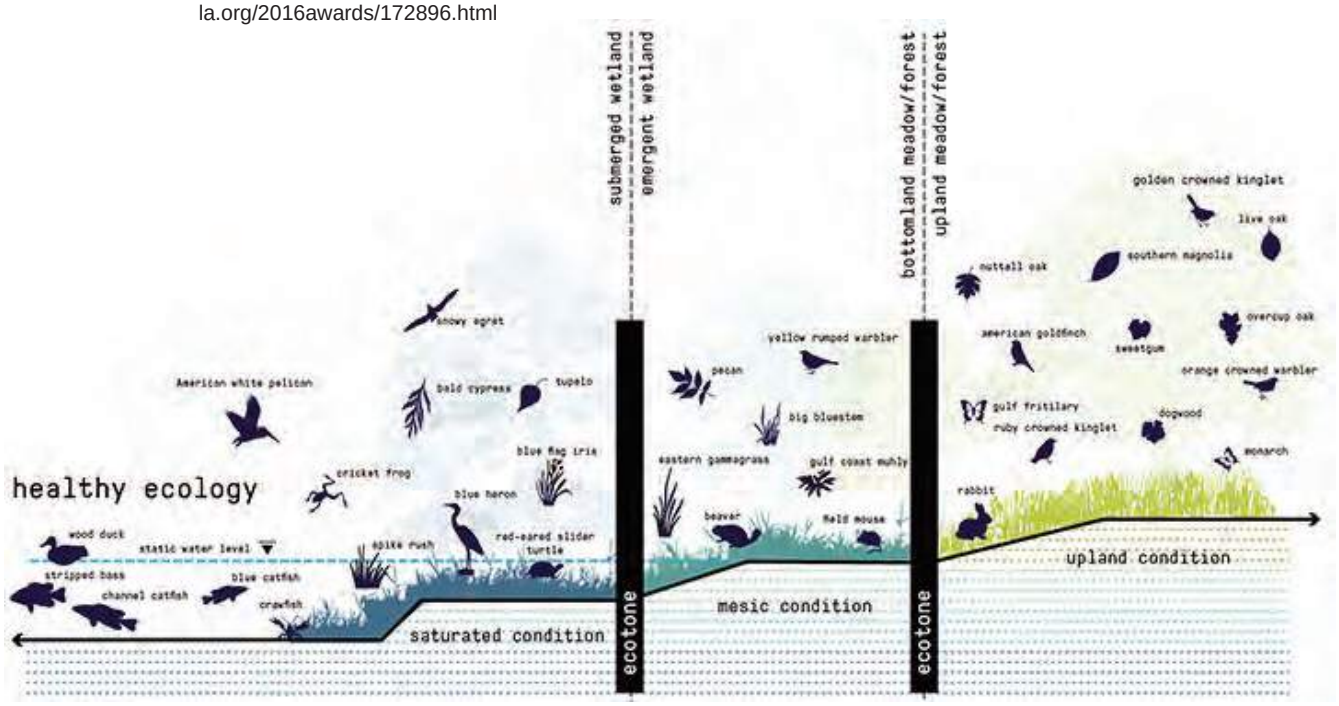


Fig. 18 Best water management practices are used to biofiltrate water, providing ecological habitats for aquatic life and healthy lifestyles for humans. Image courtesy of ASLA

Baton Rouge Lakes, Continued

Project Brief:
Baton Rouge Lakes is composed of 275 acres, containing six lakes and three parks, in the diverse neighborhood of central Baton Rouge, close to Louisiana State University. This master plan project revitalizes a dying lake system, restoring the lakes to a previously sound ecological system while reconnecting the region with its cultural heritage. Through the use of best management practices, the Baton Rouge Lakes project provides the potential for using nature as a catalyst for healthy lifestyles, while simultaneously cleansing the lake and provid-ing habitat infrastructure for migratory birds and aquatic wildlife. With a revived lake system, life and activity is brought back to central Baton Rouge, balancing the needs of both humans and the water ecology.

Science:
A living edge of wetlands and meadows was formed around the lakes to create both a biofiltration mechanism and new habitat for increasing biodiversity. The wetlands filter the first flush flows of spring from the Duplantier Bayou. This approach results in robust and diverse ecological and cultural systems with the goal of improving water quality by 80 percent.

One hundred twenty-five acres of added habitat increase the wildlife matrix by creating a complex ecological system. The included landscape typologies, based on hydric zones and local ecosystems, include upland forests, upland meadows, bottomland forests, and wetland meadows, developing a diverse flora and fauna. The biological functions of these habitats are prioritized by letting a majority of the site remain naturalized through minimal manicured areas.

Technology:
Lake conditions were measured to mitigate low dissolved oxygen, high water temperatures, high phosphorus, and fish kills. The prior poor water quality was caused, in part, from storm-water runoff from more than 85 unremediated storm drains and shallow depths of an approximated average of 3.5 feet.

Prior lake conditions were analyzed using the project’s bathymetric survey, geotechnical report, tree assessment, lake edge stability analysis, and traffic engineering studies.

Engineering:
Using a series of phased coffer dams, 600,000 cubic yards of lake was excavated to a depth of 6 feet with pockets as deep as 8-10 feet. The excavated material was used to create wetland benches, to repair failing slopes, and to expand park spaces.

To mitigate noise produced from Interstate 10, a baffle system was designed on the underside of a bridge that bisects the project’s northern lake. This baffle system also provides a bat habitat.

Mathematics:
Quantitative analysis has assessed the changes in water quality and quantity. Additionally, by making the lake 2.5-6.5 feet deeper, surrounding habitats are better able to maintain their ecological systems while filtering additional run-off.

This analysis has shown that the Baton Rouge region is an important migratory route for birds. Percentage calculations indicate that 40 percent of all migrating waterfowl and shoreline birds, as well as 50 percent of all North Ameri-can bird species use a route through these lakes. Before remediation, approximately one percent of the lake area provided a healthy habitat for migrating birds.

Project No. 9: Gathering Place

Michael Van Valkenburgh Associates, Inc., Landscape Architecture, Cambridge, MA

Fig. 19 MVVA's proposed master plan for the Tulsa Riverfront Gathering Place. Image courtesy of MVVA, Inc.

Site Location:	Tulsa, OK
Project Type:	Riverfront Park/Urban Renewal
Scope:	Interactive Public Space Along the Arkansas River
Size:	64 acres
Date:	2011 - 2018
Cost:	$465 million, gifted
Recognition:	
Citations:	"Gathering Place." Michael Van Valkenburgh Associates Inc. http://www.mvvainc.com/project.php?id=96 "Sustainability." Gathering Place; Tulsa's Riverfront Park. https://www.gatheringplace.org/sustainability-
Prime Firm:	Michael Van Valkenburgh Associates INC, Cambridge, MA
Architect:	Mack Scogin Merrill Elam Architects, Atlanta, GA
Contractor:	Crossland Construction Company, Columbus, KS
City and Community:	City of Tulsa

Fig. 20 Children playing in one of the newly constructed interactive nodes. Image courtesy of MVVA Inc.

Gathering Place, Continued

Project Brief:
The City of Tulsa, enabled by a generous gift from the George Kaiser Family Foundation, was able to transform 64 acres of a 100-acre site of fallow ground into an interactive oasis. The park is designed for the citizens of Tulsa to gather in a diverse landscape with endless activities in varied topography. The newly introduced topography provides circulation solutions and ecological benefits. The elevated areas provide layers of access, with the depressions for waterbodies creating wetland zones to reintroduce habitat for native species. The park's main purpose is to provide people with access to community spaces along the river during the hot Oklahoma summer.

Science:
The design focus of the world-class park focused on sustainability from the beginning. Through increasing native plants and trees on site, the design restores disrupted habitat. Site trees total 5,800 in a variety of 100 species. Local materials were used, durable stones for resilience and abundant ash and pine.

Six million gallons of water are circulated through the site’s adjacent wetlands to clean and treat the water without chemicals. The parking lots have underground filtration basins to capture stormwater runoff and filter pollutants.

Technology:
The buildings on site have been designed for efficient heating and cooling, with the underground maintenance buildings using geothermal wells that cool in the summer and heat in the winter.

Engineering:
The grading of the site provides unique engineering solutions with the introduction of pedestrian tunnels and bridges. The 300-foot land-bridge provides canopy coverage for the roadway and safe crossing for animals and people.

The many play structure designs include bridges, towers, and swings which required detailed engineering for safety and program use.

Mathematics:
The park uses an LED lighting system with a central control panel for efficient use that conserves energy. The system is programed to only light areas while they are in use.

Project No. 10: Railroad Park

Tom Leader Studio, Landscape Architecture, Berkley, CA

Fig. 21 Tom Leader Studio's proposed master plan for Railroad Park. Image courtesy of Tom Leader Studio.

Site Location:	Birmingham, AL
Project Type:	Brownfield Redevelopment
Scope:	Former Industrial Park Revitalized through Wetland Creation and Bio-Filtration
Size:	19 acres
Date:	2010
Cost:	$17.5 million
Recognition:	
Citations:	"Railroad Park." TLS Landscape Architecture. http://tlslandarch.com/portfolio_page/railroad-park/ "Railroad Park." Landscape Performance Series. https://www.landscapeperformance.org/case-study-briefs/railroad-park

Prime Firm:	Tom Leader Studio, Berkley, CA
Landscape Architect:	Macknally Land Design, Birmingham, AL
Architect:	Kennedy Violich Architects, Roxbury, MA
Architect:	GA Studio, Bessemer, AL
Architect:	HKW Associates, Birmingham, AL
Contractor:	Brasfield & Gorrie,
Civil Engineer:	Birmingham, AL
Lake and Stream:	Georgia Fountain Company, Tucker, GA
Irrigation:	Irrigation Consultant Services, Conyers, GA

Fig. 22 Newly designed stream system. Image courtesy of Tom Leader Studio.

Railroad Park, Continued

Project Brief:
Railroad Park is in the center of Birmingham, Alabama, where the steel industry previously resided. The park design celebrates the former use and features the existing rail lines that still run through the city. The site acts as a connection between the northern and southern halves of the city and provides space for diverse communities to come together. With the introduction of topography and a system of waterways, the re-design provides opportunity for biodiversity and the return of ecological systems that work to improve the water and air quality within the city. This project was developed through a public-private partnership led by the landscape architect, and implemented over a five-year span.

Science:
The ecological focus of the site, combined with best management practices, unites the soil with a hydrological system. Wetland creation is used for bio-filtration to manage stormwater through tree plantings that filter the water. The new tree plantings annually sequester 20,800 lbs. of carbon and intercept 92,000 gallons of stormwater runoff. With this new habitat sightings of a diverse number of bird species has increased by 250%.

Technology:
The unique historic value of the site provided unearthed materials that have been reused in the new design. Seating and retaining walls were created with these recycled materials to exemplify sustainable and historic preservation practices.

The newly constructed system of waterways features an irrigation scheme that reuses the existing site water to reduce stress on public utilities and simplify park maintenance.

Engineering:
The site engineering incorporated the historic industrial site by integrating an elevated “Rail Trail” bridge connection that allows park visitors to be eye-level with the trains.

Unique topography was introduced to the previously flat site through cut and fill earthworks, creating a chain of waterbodies and providing elevated viewing areas for a variety of park activities.

Mathematics:
The site grading of the topography and stormwater management systems used slope formula to design spaces that are equally technical and accessible, providing space for 600,000 annual visitors.

Metrics were used to calculate the success of the park through stormwater runoff, carbon sequestration, public perception, and private investment increases.

Project No. 11: Gary Comer Youth Center

Hoerr Schaudt Landscape Architects, Landscape Architecture, Chicago, IL

Fig. 23 North-South Section of the Gary Comer Youth Center and Rooftop Garden. Image courtesy of Hoerr Schaudt.

Site Location:	Chicago, IL
Project Type:	Youth & Community Center
Scope:	Urban Agriculture
Size:	8,160 square feet
Date:	2006
Cost:	$30 million
Recognition:	2010 ASLA Professional Award - Honor Award 2009 Green Roofs for Healthy Cities Awards of Excellence - Intensive Institutional Category AIA 2007 Chicago Design Excellence Awards - Special Recognition
Resources:	“Gary Comer Youth Center.” Landscape Performance Series. https://www.landscapeperformance.org/case-study-briefs/gary-comer-youth-center

Prime Firm:	Hoerr Schaudt Landscape Architects, Chicago, IL
Architect:	John Ronan Architects, Chicago, IL
Structural Engineer:	ARUP, London, UK
Greenroof System:	American Hydrotech, Midlothian, VA
General Contractor:	W.E. O’Neil Construction Co., Chicago, IL
Landscape Contractor:	Walsh Landscape Construction, Plainfield, Illinois

Fig. 24 Garden plots are divided by linear strips of recycled plastic. Photo by Scott Shigley.

Gary Comer Youth Center, Continued

Project Brief:
Located on the second floor, the 8,160-square-foot roof on the Gary Comer Youth Center is a transformed garden for urban agriculture. It is a model for a previously underutilized space designed as a balance of an aesthetic vision with a practical use. The Gary Comer Youth Center is a safe place for community members and children to come and enjoy indoor activity, and with the extension of the roof garden a safe outdoor space has been provided. The Center's full time garden manager maintains the flower and working vegetable garden to enhance educational opportunities for the Gary Comer Youth Center.

Science:
A flower and working vegetable garden provides urban agriculture, promoting horticultural learning, environmental awareness, and food production for community members.

The rooftop farm's surface bed eases stormwater runoff during rain events, absorbing rainwater rather than directly diverting it to city sewers.

Technology:
The rooftop garden provides insulation to the inside building, reducing climate control costs for the Center, while reducing the urban heat island effect in the city.

Through utilizing building and solar heat, temperatures are maintained to create a hospitable micro-climate in the courtyard. Differences between ground temperatures and roof temperatures put the garden into a different climate zone, making it usable year round. Temperatures average between 20-30°F warmer in the winter and 10°F cooler in the summer.

Engineering:
Garden soils are 18-24 inches deep, making the garden viable for food production. With the soil depth, the roof is able to withstand garden tools and children enthusiastically digging root vegetables. Irrigation and weight is measured to ensure both structural support and agricultural growth.

Plastic lumber, made from recycled milk cartons, forms pathways and garden plot separation, aligning with the courtyard's window frames. Metal light wells are artistically scattered throughout the garden and provide passive solar light for the gymnasium and café below.

Mathematics:
The insulating rooftop garden saves $250 in annual heating and cooling costs compared to conventional roofs.

The urban agricultural garden produces over 1,000 pounds of organic food annually. This is used by students, local restaurants, and the center's café.

Project No. 12: ASLA Headquarters Green Roof

Michael Van Valkenburgh Associates, Inc., Landscape Architecture, Cambridge, MA

Fig. 25 Master plan for the ASLA Headquarters green roof. Image courtesy of MVVA, Inc.

Site Location:	Washington, D.C.		
Project Type:	Office	**Prime Firm:**	Michael Van Valkenburgh Associates, Inc., Cambridge, MA
Scope:	Green Roof		
Size:	3,000 square feet	**Consulting Landscape Architect:**	Conservation Design Forum, Lombard, IL
Date:	2006		
Cost:	$350,000		
Recognition:	2010 Green Roofs for Healthy Cities Award of Excellence 2008 Natural Resources Council of America Best Education Project 2008 Washington Business Journal Green Business Award for Education & Outreach	**Architect:**	DMJM Design, Washington D.C.
		Structural Engineer:	Robert Silman Associates, Boston, MA
		Green Roof Plants:	Emory Knoll Farms, Street, MD
Citations:	“ASLA Headquarters Green Roof.” Landscape Performance Series. https://www.landscapeperformance.org/case-study-briefs/asla-headquarters-green-roof		

Fig. 26 A variety of green roof plantings create opportunity for habitat of small migratory species. Image courtesy of American Society of Landscape Architects.

ASLA Headquarters Green Roof, Continued

Project Brief:
ASLA implemented a green roof design strategy at their headquarters to demonstrate the sustainability commitment of landscape architects. They received a grant from the Chesapeake Bay Commission as green roofs have a significant role to play in collecting and filtering water before it enters the natural hydrological system. The roof features a variety of plantings that incorporate six distinct green roof conditions with soil depths ranging from three inches to twenty-one inches in elevated locations. The roof acts as a test and model for future green roofs; the plants and performance metrics are constantly being monitored to assess the roof's capacity for mitigating climate-related stresses on the environment.

Science:
The green roof reduces the amount of nitrogen entering the watershed, according to results from water quality testing. By addressing the water quality issues at the source, the roof improves the overall health of the water and the ecological communities that rely on it.

The plant palette intentionally includes "experimental" plants along with those that have been green-roof tested and are in common use on green roof installations in the northeastern seaboard of the USA. The key species utilized are varieties of drought-resistant sedums adapted to the extreme climatic conditions common on urban roofs.

Technology:
A seamless waterproofing/roofing membrane protects the integrity of the structure by separating the green roof systems from the human uses of the building.

The insulation that the green roof provides acts as a cooling agent, with the surface temperature, during the hottest days of summer, recorded at 43.5 degrees cooler than the conventional black roofs of the buildings next to the headquarters. Two 25-foot-wide elevated "waves" form a structural skeleton filled with rigid insulation and covered with a green roof system. The waves' innovative design and placement protect the roof's usable space from noise generated by nearby HVAC units.

Flow meters and rain gauges are in place on the ASLA green roof to collect data on stormwater retention.

Engineering:
Engineering of the roof garden considered the load bearing capacity of the roof system, utilizing constructed Styrofoam to create mound conditions. The soil is also engineered with ribbons of non-biodegradable plastic to prevent erosion and reduce the structural load.

Mathematics:
The 3,000-square-foot green roof has monitors that track stormwater runoff, water quality, and air temperature to compare with data from the conventional roof on the building next door. In eleven months the roof prevented 27,500 gallons of stormwater (77 percent of all precipitation hitting the roof) from entering the sewer system in Washington, D.C.

Project No. 13: Millennium Park

Terry Guen Design Associates, Landscape Architecture, Chicago, IL

Fig. 27 The Lurie Garden at Millennium Park features 35,000 different perennial plant species. Image courtesy of Lurie Garden.

Site Location:	Chicago, IL		
Project Type:	Park/Open Space	**Prime Firm:**	Terry Guen Design Associates Chicago, IL
Size:	24.5 acres		
Date:	2004	**Consulting Landscape Architect:**	Gustafson Guthrie Nichol, Ltd. Seattle, WA
Cost:	$482.4 million		
Recognition:	2017 Best Continued Use, Lurie Garden 2009 Rudy Bruner Award for Urban Excellence, Silver 2008 Professional Award of Excellence, ASLA 2006 Excellence in Urban Design, AIA	**Planting Designer:**	Piet Oudolf
		Architects:	Frank Gehry, Hammond Beeby Rupert Ainge, OWP&P, Kreuck Sexton, Jaume Plensa
Citations:	“Millennium Park.” Landscape Performance Series. https://www.landscapeperformance.org/case-study-briefs/millennium-park#/project-team	**Engineers:**	Skidmore Owings & Merrill, McDonough Assoc.
		Developer:	Public Building Commission of Chicago
		Artist:	Anish Kapoor

Fig. 28 Millenium Park is situated in downtown Chicago, offering an urban public park and plaza for city residents and 3 million yearly visitors. Image courtesy of Terry Guen Design Associates.

Millennium Park, Continued

Project Brief:
Millennium Park, in Chicago's East Loop District, transformed a former parking lot and rail yard into one of the world's largest green roofs. The park has become an icon in Chicago and an example of dynamic placemaking that has the capacity to spawn increasing tourism and development in an underutilized part of the city. With the addition of the Park, Chicago's green space increased by 62 percent.

Science:
The intensive green roof provides 12.24 acres of permeable surface, making up almost half the park's total surface area. Large areas of this permeable surface are planted zones, with 35,000 perennials, 5,800 woody plants, and 450 trees, 60 percent of which are native to the Midwest. These plantings have been designed as ecologically sensitive and low-maintenance to increase biodiversity and lower costs.

Within the park there are over 15 environmental education programs for both children and adults.

Technology:
The Park offers multi-model transportation with a focus on sustainable methods, including I-GO car-sharing cars, 250 rental bikes provided through the McDonald's Cycle Center, and light rail and bus stops within a five-minute walk.

As a former rail yard, the site soils were highly contaminated and required remediation efforts, utilizing the parking garage's bottom floor as the cap for contaminated soils.

Engineering:
As a park built over an existing parking garage, repairs to the garage were necessary to reinforce its load-bearing capacity, specifically addressing existing columns which had developed cracks from additional loads that had exceeded original specifications.

Mathematics:
In order to determine the load-bearing capacity of the parking garage, and remediation of soils for new plantings, load calculations had to take into account the weights of trees 100 years into the future.

The iconic park has contributed to a $1 billion increase in real estate values in downtown Chicago, and an additional $1.2 billion in tourism revenue yearly for the city.

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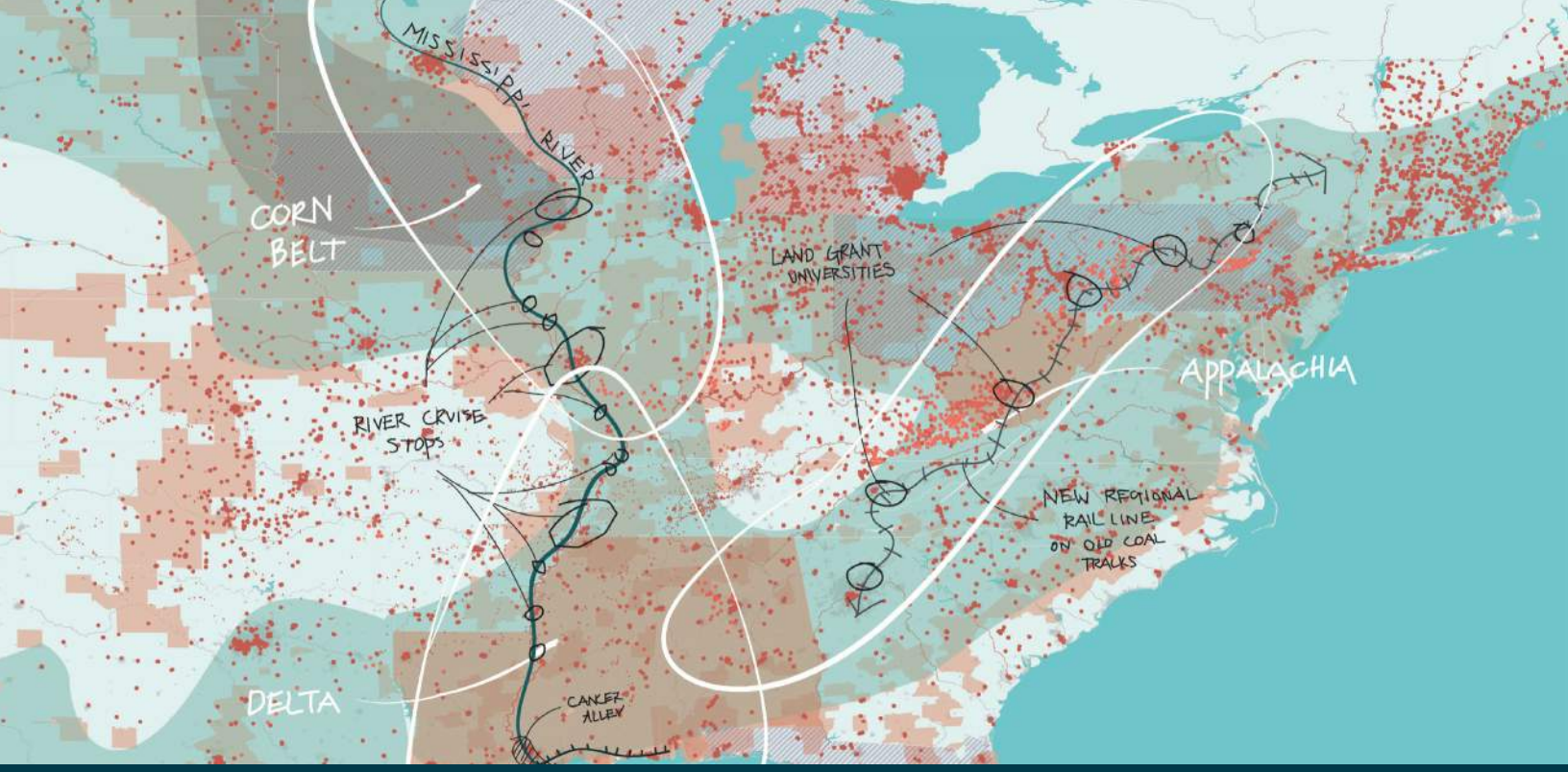

Accreditation Standards

For Professional Programs in Landscape Architecture

September 2021

Landscape Architectural Accreditation Board

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2020 ASLA Student Collaboration Award of Excellence. Designing a Green New Deal.
Leila Bahrami; Chelsea Beroza; Allison Carr; Yvette Chen; Zachery Hammaker, ASLA; Sara Harmon; Tiffany Hudson; Katie Lample; John Michael LaSalle; Rob Levinthal; Katherine Pitstick, ASLA; Joshua Reaves; Will Smith; Jesse Weiss; Rosa Zedek, Student ASLA.
University of Pennsylvania. Faculty Advisors: Billy Fleming, ASLA
(Image credit: Project Team)

Introduction

The mission of the Landscape Architectural Accreditation Board (LAAB) is to evaluate, advocate for, and advance the quality of education in professional programs leading to a degree in landscape architecture. To do that, the Board creates and applies Accreditation ***Standards*** and Accreditation ***Procedures*** which LAAB develops with input from the communities of interest. The Standards are qualitative statements of the essential conditions which a professional program in landscape architecture must meet to achieve accreditation. The Procedures identify the mission, goals, and values of LAAB, define the accreditation process, and establish the basis for decision-making within and action undertaken by the LAAB. LAAB regularly reviews and assesses the Standards and Procedures—at a minimum of once every five years—through a process articulated in the Accreditation Procedures.

This document contains the Accreditation Standards.

Core Values

The profession of landscape architecture serves two primary principles in the planning, design, and stewardship of natural and built environments: 1) to protect the health, safety, and well-being of people and communities, including future generations; and 2) to safeguard the health and resilience of natural systems, ecosystems, and non-human inhabitants.

LAAB believes the following Core Values are essential to the education of future landscape architects. Accordingly, the professional program shall embed these Core Values into its curriculum, policies, community, processes, and activities, and identify and engage in contemporary issues in alignment with these Core Values.

1. **Environmental Health, Sustainability, Resilience, and Stewardship**: Landscape architects preserve, plan, design, and steward healthy environmental systems that promote the health and resilience of the environment, people, and cultures. Well-functioning ecological and biological systems are assets essential to the well-being, sustainability, and resiliency of current and future generations.

2. **Diversity, Equity, and Inclusion**: Landscape architects, through their professional undertakings and products, strive to create and maintain an inclusive and welcoming climate which embraces differences, offers respect in words and actions, displays cultural sensitivity and competence, and values all people and their perspectives as essential for the health and well-being of diverse individuals and communities.

3. **Human and Community Health and Safety**: Landscape architectural practice impacts individual and community health, safety, and well-being. Landscape architects commit to methodologies that study and understand the public protections, policies, and environmental justice outcomes that improve individual and community health.

4. **Professional Ethics and Responsibility**: Landscape architects serve the environment, the public, and their clients; address inherent conflicts in those services with honesty, integrity, fairness, equality, dignity, and with a recognition of diverse and individual rights; and advocate for the principles of the profession.

5. **Leadership and Innovation**: To practice effectively in changing contexts, landscape architects seek continuous advancement of their own and the discipline's values, knowledge, and skills; create new ideas and knowledge; effect positive change in the environment; and lead, inspire, facilitate, and empower innovation.

6. **Application of the Sciences to the Design of Natural and Built Landscapes**: As practitioners of a discipline firmly rooted in the natural, physical, and social sciences, landscape architects utilize science, technology, engineering, and mathematics to develop innovative, site-specific design solutions that protect both human and environmental health and safety.

Definitions, Interpretation, and Application

The information which follows is included to clarify the meaning and intent of words and terminology used throughout these Standards.

Accreditation: Accreditation is a voluntary process of peer review designed to evaluate programs against not only the accreditation standards that follow but also the program's own stated objectives.

Accreditation Procedures: Accreditation Procedures define the accreditation process and establish the basis for decision-making and action undertaken by the Board.

Administrative Probationary Accreditation: Administrative Probationary Accreditation status is assigned when an institution or professional program does not meet its administrative obligations. LAAB assigns this status if the institution or professional program fails to comply with one or more of the following requirements:

- paying annual fees within 90 days of the invoice date,
- paying a late fee by the due date,
- submitting reports or other required information within 45 days of the due date, or
- agreeing to a reasonable on-site evaluation visit date at or near the time established by LAAB staff.

Administrative Probationary Accreditation is an accreditation category not subject to appeal. The professional program is recognized and listed as accredited with this designation until the requirement(s) that was not met has been fully satisfied. Failure to completely remedy the situation by the date specified in the probationary letter may result in revocation of accreditation.

***Assessment*:** Assessment is the process by which a professional program or institution's level of compliance with and achievement of the accreditation-relevant criteria is evaluated.

Candidacy: Candidacy status is an accreditation classification granted to a professional program that is in the planning or early stages of development, or in an intermediate stage of program implementation.

Compliance: Compliance with a standard is achieved when LAAB concludes—after review of relevant indicators or other evidence—that the standard is "Met" or "Met with Recommendation," as defined below. To achieve LAAB accreditation, a professional program must demonstrate through the Self-Evaluation Report, site visit, and technical accuracy review of the Visiting Team's Report that it complies with all standards.

Considerations for Improvement: Considerations for Improvement are informal counsel offered to a professional program as a part of the Visiting Team's Report but not included in the final action letter from LAAB to the professional program. These may be areas where the professional program can build on a strength or address an area of concern that does not directly affect accreditation at the time of the LAAB review.

Core Values: The five (5) foundational values identified by LAAB and further described by these Accreditation Standards that inform the education of future landscape architects.

Criteria: Each LAAB standard has one or more criteria statements that define the requirements needed to satisfy the standard. Failure to satisfy a criterion does not automatically lead to the assessment of a standard as not met. To be accredited, a professional program must demonstrate progress toward meeting the criteria. In this document, criteria are identified by letters (for example: **A. Program Mission**).

Cultural competence*:* Cultural competence refers to the understanding, willingness, and honesty in working with diverse individuals and communities in ways that are responsive to and reflective of historical and cultural settings. These competencies include self-awareness, open-minded inquiry and assessment, and the ability to recognize and adapt to cultural diversity. Programs should strive to work with individuals and communities that reflect cultures that are different from the program's dominant culture. Recognizing and adapting to cultural differences—and being conscious of these differences—is integral to the art and science of landscape architecture.

Diversity: Diversity includes all the ways in which people differ. While diversity is often used in reference to race, ethnicity, and gender, we embrace a broader definition of diversity that also includes abilities, age, education, gender identity, language, marital status, national origin, physical appearance, religion, sexual orientation, and socioeconomic status. Our definition also includes diversity of ideas, perspectives, and values. We also recognize that individuals affiliate with multiple identities.

Equity: Equity is the fair treatment, access, opportunity, and advancement for all people. Equity demands that we identify and understand the root causes of unjust outcomes, eliminate systemic barriers to justice, and strive to create a more equal society.

Faculty Full-Time Equivalence (FTE): The FTE is a figure representing the aggregated time committed by full- and part-time faculty members to teaching in a department or professional program, including both faculty who have their duties or teaching assignments split between an undergraduate and a graduate program, and also faculty who have their assignments split between disciplines. For purposes of calculation, a faculty member with a part-time appointment of 50 percent would be assigned a 0.5 FTE. A full-time faculty member with duties in only one department would be assigned an FTE of 1.0 for that department.

Final Action Letter: A final action letter is an official communication from LAAB to a professional program reporting its accreditation status and any recommendations affecting accreditation.

Inclusion: Inclusion is the act of creating environments in which any individual or group can be and feel welcomed, respected, supported, and valued to fully participate. An inclusive and welcoming climate embraces differences and offers respect in words and actions for all people. Increasingly, recognition of unconscious or implicit bias helps organizations to be deliberate about addressing issues of inclusivity. Importantly, while inclusive groups are diverse by definition, not all diverse groups are necessarily inclusive.

Initial Accreditation: The first period of accreditation for a professional program leading to a degree in landscape architecture is its initial accreditation; LAAB initial accreditation applies to degrees awarded within two years prior to initial accreditation by LAAB.

Interim Report: An interim report is an annual update documenting progress toward meeting Recommendations Affecting Accreditation, and is additional reporting required for any program that is given one or more Recommendations Affecting Accreditation.

Long-Range Plan: A long-range plan is the output of a process that examines the mission, goals, objectives, and aspirations of a professional program over a minimum of three years. A strategic plan may be a long-range plan provided it meets the terms of this definition.

Professional Program: A professional program in landscape architecture encompasses the body of knowledge common to the profession and promotes acquisition of the knowledge and skills necessary to enter professional practice. A professional program has an academic offering based on a mission that articulates its purpose and goals, and a professional program also comprises the coursework and other learning experiences leading to a degree. A professional program has an administration, faculty, staff, facilities, and services that supports its mission, provides learning experiences, and complies with these Standards. At the bachelor's level, a professional program is typically conducted in a context enriched by the liberal arts and natural and social sciences. At the master's level, a professional program also provides instruction in and application of research and scholarly methods.

Program Administrator: A program administrator is responsible for the operation of the professional program in compliance with the Standards.

Recommendations Affecting Accreditation: Recommendations Affecting Accreditation (Recommendations) are issues of serious concern that directly affect the quality of a professional program. Recommendations are issued when a visiting team assesses a standard as "Standard Met with Recommendation" or "Standard Not Met." Recommendations are derived from the identified areas of weakness in meeting a standard as described in the rationale sections of a visiting team's report. The professional program is required to submit an Interim Report for each Recommendation issued during an initial accreditation or accreditation renewal. Recommendations identify issues; they do not prescribe solutions.

Self-Evaluation Report (SER): A SER is a document prepared by a professional program that describes its expectations, operations, and resources; assesses its progress toward meeting its mission, goals, and objectives; and measures its performance against the criteria for accreditation.

Shall: In official LAAB standards and criteria, "shall" indicates mandatory actions for a professional program or institution.

Standards: Standards are qualitative statements of the essential conditions an accredited professional program must meet to achieve accreditation.

Standard Met: A "Standard Met" designation indicates that overall program performance in the relevant area meets LAAB minimum standards. LAAB may judge a standard as met even though one or more indicators within the standard are not minimally met.

Standard Met with Recommendation: A "Standard Met with Recommendation" designation indicates that deficiencies exist in an area directly bearing on accreditation. The problem or problems have observable effects on the overall quality of the professional program.

Standard Not Met: A "Standard Not Met" designation means that a cited deficiency is so severe that the overall quality of a professional program is compromised, and the professional program's ability to deliver adequate landscape architecture education is impaired.

Track: A track is an organized curricular or course-of-study path through a professional program leading to a degree.

Minimum Requirements for Achieving and Maintaining Accredited Status

1. An accredited professional program's title and degree must incorporate the term "landscape architecture."

2. A professional program offering an accredited undergraduate professional degree must meet the following degree length requirements.

    a. An undergraduate professional program leading to a Bachelor of Landscape Architecture (BLA) or a Bachelor of Science of Landscape Architecture (BSLA) degree must be a single-degree program that has a minimum number of total credit hours equivalent to its institution's definition of four academic years of full-time undergraduate enrollment.

    b. A professional program may allow for advanced placement up to one academic year, provided it has a clearly articulated policy and criteria for advanced placement and how the professional program determines whether an applicant meets the criteria. The advanced placement may be counted towards the minimum requirements referenced in 2.a above.

    c. Any professional program that offers a degree with Bachelor of Landscape Architecture or BLA, or a Bachelor of Science of Landscape Architecture or BSLA in the degree title must meet the requirements of the LAAB accreditation standards. This includes a professional program that offers a BLA degree with an advanced placement track or pathway. An institution that offers a program or track leading to a degree with the words "Bachelor of Landscape Architecture" or "BLA", or "Bachelor of Science in Landscape Architecture" or "BSLA" in the title that does not comply with these Standards is not eligible to offer any accredited BLA or BSLA degree.

3. A professional program offering an accredited graduate professional degree must meet the following degree length requirements:

    a. The graduate professional program, leading to a Master of Landscape Architecture (MLA) must be a single-degree program that has a minimum number of total credit hours equivalent to its institution's definition of three academic years of full-time graduate enrollment.

    b. A professional program may allow for advanced placement of up to one academic year of study, provided it has a clearly articulated policy and criteria for advanced placement and demonstrates how the professional program determines whether an applicant meets the criteria. The advanced placement may be counted towards the minimum requirements referenced in 3.a. above.

    c. Any professional program that offers a degree with Master of Landscape Architecture or MLA in the degree title must meet the requirements of the LAAB accreditation standards. This includes a professional program that offers an MLA degree with an advanced-placement track or pathway. An institution that offers a program or track leading to a degree with the words "Master of Landscape Architecture" or "MLA" in the title that does not comply with these Standards is not eligible to offer any accredited MLA degree.

4. An institution may offer a program leading to a degree with the title "Master of Science in Landscape Architecture" or "Master of Arts in Landscape Architecture" that is not an accredited degree in Landscape Architecture without jeopardizing the institution's accredited degree in Landscape Architecture. In offering such a degree, an institution must disclose that the degree is not accredited in its public statements and to the Council of Landscape Architectural Registration Boards (CLARB).

5. A professional program may be offered in whole or in part through an online platform. A professional program that offers all or part of its curriculum through an online platform must demonstrate that it meets all the requirements of these Standards.

6. Faculty instruction full-time equivalence (FTE) requirements are as follows:

    a. An academic unit that offers a single professional-degree program at the Candidacy or Initial Accreditation status has at least three FTE instructional faculty who hold professional degrees in landscape architecture, at least one of whom is full-time.

    b. An academic unit that offers a professional-degree program at both the bachelor's and master's levels at the Candidacy or Initial Accreditation status has at least six FTE instructional faculty, at least five of whom hold professional degrees in landscape architecture, at least two of whom are full-time in the department.

    c. An academic unit that offers a single professional-degree program at the continuing full accreditation status has an FTE of at least five instructional faculty, at least four of these faculty members hold a professional degree in landscape architecture, at least three of whom are full-time in the department.

    d. An academic unit that offers professional-degree programs at both the bachelor's and master's levels with continuing full accreditation status has an FTE of at least seven instructional faculty, at least five of whom hold professional degrees in landscape architecture and are full-time in the department.

Program Status	Number of Full-time Equivalent Instructional Faculty*	Number of Faculty members with an accredited Professional Degree in Landscape Architecture (could be part-time or adjunct)	Number of Full-time Faculty members with an accredited Professional Degree in Landscape Architecture
Programs seeking Initial Accreditation			
Single Program	3	3	1
Existing Program adding a new Program	6	5	4
Programs seeking re-accreditation			
Single Program	5	4	3
Bachelor's and Master's Program	7	6	5

    * In determining FTEs and the pro-rata contribution some faculty may make to teaching in a professional program, we acknowledge that variations do exist among institutions regarding how standard teaching loads are determined. Please provide in the SER any commentary that you believe appropriate to demonstrate how your professional program achieves the required faculty numbers within your institution's particular administrative and staffing model.

7. The parent institution must be accredited by an institutional accrediting agency recognized by the U.S. Department of Education.

8. There must be a designated program administrator responsible for the leadership and management functions for the professional program under review. The program administrator shall have significant influence in the budget and personnel management decisions of the professional program.

9. The professional program must provide a comprehensive disclosure about the professional program's status and performance as set forth in Standard 1.E within a single-click link from the professional program's website.

10. The professional program must:
    - continuously comply with accreditation standards,
    - pay the annual sustaining fee and other fees as required, and
    - regularly file complete annual and other requested reports, as required by the Accreditation Procedures.

11. The program administrator shall inform LAAB if any of these factors fail to apply during an accreditation period. The program administrator is responsible for reporting any substantive changes to the professional program when they occur. (Substantive changes are those that may affect the accreditation status of the professional program, addressed in the LAAB Accreditation Procedures.)

STANDARDS

Standard 1: Program Mission and Goals

The professional program shall have a clearly defined mission supported by goals appropriate to the profession of landscape architecture and the Core Values of these Standards, and that promotes diversity, equity, and inclusion. The program shall demonstrate progress toward the attainment of its mission and goals.

A. Program Mission.

The professional program shall have a mission statement which expresses the underlying purposes and values of the professional program; defines for the faculty, students, prospective students, and the institution its values and fundamental purpose; and summarizes why the professional program exists.

Assessment 1: The professional program has a clearly stated mission reflecting its purpose and values, which relates to the institution's mission and addresses the Core Values.

B. Educational Goals.

The professional program shall have clearly defined and formally stated academic goals that reflect the mission and demonstrate that attainment of the goals will advance the professional program's mission.

Assessment 1: The professional program has clearly defined, achievable educational goals.

Assessment 2: The professional program has an effective procedure which it uses regularly to assess and determine progress in meeting its goals.

Assessment 3: The professional program provides benchmarks for assessing and advancing the professional program in meeting the stated goals.

C. Commitment to Diversity, Equity, and Inclusion.

The professional program shall demonstrate—through concrete steps—systematic, coherent, and long-term efforts to incorporate diversity, equity, and inclusion through its program. The program shall provide a learning environment that prepares students with a broad range of cultural competencies to navigate a diverse professional world.

Assessment 1: The professional program defines its under-represented populations, explains why these groups are of particular interest and importance to the professional program, and describes the process used to define the under-represented population(s). The professional program should take into consideration populations under-represented within the profession.

Assessment 2: The professional program describes its specific goals for increasing the representation and retention of under-represented population(s) among students, faculty, and staff; the actions and strategies it has identified to advance those goals; and its method for measuring success.

Assessment 3: The professional program shall demonstrate its commitment to advance diversity and cultural competency through a variety of practices including the development and/or implementation of policies that advance and support a welcoming climate of equity and inclusion that is free of harassment, aggressions, and discrimination.

D. Long-Range Planning Process.

The professional program shall engage in an effective long-range planning and program assessment process.

Assessment 1: At the time of an accreditation review, a professional program has a long-range plan in effect.

Assessment 2: The long-range plan describes how the professional program's mission, goals, and objectives will be met, and the professional program documents the review and evaluation process.

Assessment 3: A professional program reviews and revises its long-range plan (along with its mission, goals, and objectives) periodically and determines if the plan presents realistic and attainable methods for advancing the professional program's academic mission.

E. Program Disclosure.

A professional program shall accurately disclose the following information about each landscape architecture degree in its literature, in its promotional media, and on its website:

a. the professional program's mission, objectives, and goals,
b. accreditation status,
c. estimated cost of attendance, including fellowship, assistantship, and scholarship opportunities and other financial support options to reduce the cost of attending,
d. student retention and graduation rates,
e. number of degrees granted per year,
f. percentage of students with timely graduation,
g. list of required and optional materials and equipment and provides an estimated cost as well as available shared resources or alternative access,
h. supplemental and experiential learning opportunities associated costs and potentially available subsidies,
i. post-graduation employment,
j. number of licensed faculty, and
k. in accordance with the Higher Education Act, disclose whether or not the program meets the educational requirements for licensure eligibility in each U.S. state.

Assessment 1: The professional program information is accurate, understandable, and accessible to the public.

Assessment 2: The professional program disclosure information can be found with a single-click link from the professional program's website.

Standard 2: Program Autonomy, Governance, and Administration

The professional program shall have the authority and resources to achieve its mission and goals, and shall be recognized as a discrete professional program with the resources, institutional support, and authority to enable achievement of the stated program mission and goals.

A. Program Administration.

The landscape architecture program shall be administered as an identifiable, discrete program within its institution.

Assessment 1: The professional program is seen as a discrete and identifiable program within the institution.

Assessment 2: The program administrator holds a faculty appointment in landscape architecture.

Assessment 3: The program administrator exercises effective leadership of and management functions for the professional program. (Where the program administrator is not the primary administrator for the academic unit, as in a landscape architecture program within a multidisciplinary department or school, the landscape architecture leader has the authority to significantly influence the management of resources, including budget, faculty review, tenure and promotion outcomes, and the direction of the professional program.)

B. Institutional Support.

The institution shall provide sufficient resources to enable the professional program to achieve its mission and goals, and it shall support individual faculty members' development and advancement.

Assessment 1: Funding is available to assist faculty and other instructional personnel with continued professional development, including support in developing funded grants and attendance at conferences. Funding is sufficient to maintain computers and appropriate software, other types of equipment, and technical support.

Assessment 2: Funding is adequate for student support, such as scholarships and work-study jobs.

Assessment 3: Adequate support personnel are available to accomplish the professional program's mission and goals.

C. Faculty Participation.

The faculty shall participate in program governance and administration.

Assessment 1: The faculty makes recommendations on the allocation of resources and has the responsibility to develop, implement, evaluate, and modify the professional program's curriculum, and to contribute to operating practices.

Assessment 2: The faculty participates, in accordance with institutional guidelines, in developing criteria and procedures for annual evaluation, promotion, and tenure of faculty members.

Assessment 3: The faculty participates, in accordance with institutional guidelines, in developing and applying criteria and procedures for the appointment and assessment of professional program and academic unit leadership.

Assessment 4: The professional program or institution adequately communicates with and provides mentoring services to faculty regarding policies, expectations, and procedures for annual evaluations, tenure, and promotion to all ranks.

D. Faculty Number.

The faculty shall be of a sufficient size to accomplish the professional program's goals and objectives, to teach the curriculum, to support students through advising and other functions, to engage in research, creative activity, and scholarship, and to be actively involved in professional endeavors such as presenting at conferences. The faculty FTE shall be assessed by the institutional culture for faculty development across the closely related academic units (such as other departments and programs within a college). The workload (number, type, and sizes of courses assigned) and responsibilities (such as a split of time for teaching, research, and service activities) for a typical tenured or long-term faculty member within the college shall be considered the template for assessing the FTE resources assigned to the landscape architecture program. Where landscape architecture faculty members have their responsibilities split between programs (such as bachelor's and master's or between landscape architecture and another discipline), the FTE assessment must be prorated.

Assessment 1: Student/faculty ratios in studios are typically not greater than 15:1.

Assessment 2: There are sufficient faculty FTE to carry out the mission, goals and objectives of the professional program (such as duties in teaching, research, service, program administration, academic advising, and creative professional development).

Standard 3: Professional Curriculum

The professional degree curriculum includes the Core Values of these Standards, the knowledge, skills, and competencies of landscape architecture, and the learning goals stated by the professional program. The curriculum encompasses coursework and co-curricular opportunities intended to develop students' knowledge and skills in landscape architecture.

A. Curricular Expression of the Mission, Goals, and Core Values.

The professional program shall integrate its mission, goals, and the Core Values into the curriculum.

Assessment 1: The professional program demonstrates how the curriculum reflects its mission and goals and the Core Values.

B. Learning Outcomes.

A professional program shall establish learning outcomes that shall include competency in the following:

1. Knowledge

a. **Design Process, Principles and Theory**, i.e. the range of creative, cultural, and historical approaches to developing material, spatial, and temporal landscape compositions, site-specific design solutions, and other creative responses that are grounded in the natural, physical, and social sciences and address aesthetic, environmental, and social issues and goals.

b. **Histories and Theories of the Art and Science of Landscape Architecture**, i.e. built and natural environment, and urban, community, and ecological planning and design; framed by diverse social, cultural, economic, political, and scientific forces in North America and globally.

c. **Plants, Ecosystems, and Climate Science**, i.e., the abiotic and biotic aspects of ecosystems associated with natural and constructed landscapes; application of ecology, botany, and horticulture principles to the design of the landscape; knowledge of soil science and geology and their impact on the landscape; impacts associated with landscape engineering, development, post-construction management, and maintenance; and the interrelationships between ecosystems and climate.

d. **Resilience**, i.e., the social, human, economic, and environmental principles of sustainability and resilience; landscape performance categories, metrics, and methodologies; and the use of behavioral sciences to assess the impacts of design within diverse social, human, economic, and environmental systems.

e. **Legal Context of the Profession**, i.e., the legal responsibilities and the role of landscape architects to preserve and safeguard human health, safety, and the public welfare through their professional practice; maintaining the intrinsic values of environmental, historic, cultural, and community resources in compliance with legal and regulatory frameworks; and the regulatory professional practice and licensure requirements.

f. **Professional Practice**, i.e., the current and emerging practice opportunities that utilize landscape architectural skills and knowledge in a variety of private, public, academic, and non-governmental settings; project management and delivery; the ethical and professional obligations to clients, communities, the public, and the landscape and environment; and life-long learning, advocacy, career development, and the role of professional and community organizations.

2. Skills and Competencies

a. **Assessment**, i.e., analysis of the physical, biotic, climatic, and cultural context of a project; comprehensive synthesis of objective and subjective analysis; evaluation of the suitability of a program to multiple sites and prioritization of a site based on program; evaluation of spatial and other relevant data; and communication of the criteria and methodologies used in evaluation.

b. **Design and Construction**, i.e., generation of multiple design concepts for a project; evaluation and critique of alternatives and synthesis of ideas into a comprehensive, implementable result; application of the natural, physical, and social sciences in the development of innovative and site-specific design solutions; design decision-making that incorporates physical, cultural, climatic, and regulatory context, the diverse needs of users, considering all abilities and modes of perception, equitable access, ecological health, and temporal change, materials and constructability.

c. **Communication**, i.e., the use of verbal, nonverbal, visual, and written communication to clearly and concretely express ideas; solicit ideas from, listen to, and seek to understand and communicate effectively with diverse audiences; and thoughtfully provide, receive, and respond to feedback and critiques; all while demonstrating empathy and respect.

d. **Construction, Materials and Methods**, i.e., the integration of materials, engineering, specifications, and construction techniques in a design proposal; selection of materials for character, quality, cost, constructability, sustainability, and cultural relevance; preparation of design development, construction documents, details, and understanding of construction administration and oversight.

e. **Landform/Landscape Engineering and Green Infrastructure**, i.e., applying quantifiable principles and practice of engineering including grading, drainage, water quality and management, and other landform processes to design landscapes that are accessible, safe, and ecologically sustainable.

f. **Numeracy/Quantification**, i.e., the mathematical calculations to inform and substantiate design and construction performance.

g. **Landscape Performance**, i.e., the ability to define and measure the impact of a design on its environmental, social, and economic goals based on measurable outcomes; identification of types of data to measure project impact(s); and use of performance metrics to measure performative impacts of a project.

h. **Collaboration**, i.e., leadership and collaboration on multidisciplinary teams; and the incorporation of knowledge from other disciplines, professions, and perspectives for example sustainable development, environmental policies, ethics, ecology, city and regional planning, economics, natural resources, sociology, and anthropology.

i. **Research (graduate level)**, i.e., articulation of a clear research theory; selection and application of appropriate research methods; placement of work within an existing body of knowledge and articulation of the significance of the work to the field; the practice of research ethics and responsible conduct; and work autonomously and effectively to complete independent project; and the contribution of new knowledge to the profession to address current and future challenges.

Assessment 1: The curriculum integrates the professional knowledge, skills, and competencies in a clearly defined sequence.

Assessment 2: The curriculum identifies and engages in contemporary issues in alignment with the Core Values.

Assessment 3: Student work and other accomplishments demonstrate that students are achieving these professional skills and competencies.

Assessment 4: Curriculum enables students to pursue academic interests consistent with institutional requirements, enter into the profession, and be prepared to pursue licensure.

Assessment 5: (for graduate level only) Student work and other accomplishments demonstrate student mastery of research skills.

C. General Studies.

1. In addition to the professional curriculum, a professional degree program at the bachelor's level shall provide an educational context enriched by other disciplines, including but not limited to liberal and fine arts, natural, physical, and social sciences, as well as opportunities for students to develop other areas of interest. This may be covered within the institution's general education requirements.

2. A professional degree at the master's level that does not require all students to have an undergraduate degree before receiving the MLA shall meet requirement 1.

Assessment: Students take courses in the humanities, arts, technologies, mathematics, natural sciences, social sciences, and/or other disciplines.

D. Delivery of and Augmentation to Curricular Experience.

Students shall participate in service learning and interdisciplinary curricular experiences outside of the professional program. The professional program shall provide opportunities for co-curricular activities such as institutional and professional activities, internships, off-campus studies, research assistantships, or practicum experiences.

Assessment 1: Students participate in service-learning projects and interdisciplinary curricular experiences outside of the professional program.

Assessment 2: The professional program identifies the objectives of and documents students' participation in both service-learning projects and interdisciplinary curricular experiences outside of the professional program.

Assessment 3: The professional program provides opportunities for students to augment their formal educational experience—through events such as LABash, ASLA Conference on Landscape Architecture, state and local ASLA chapter events, LAF Symposium and research and activities, and the activities of other professional societies or special-interest groups—and also documents students' participation in these opportunities.

Assessment 4: The professional program provides students with opportunities to share these experiences with their fellow students.

E. Areas of Interest (Bachelor's Level).

The professional program shall provide opportunities for students to pursue or develop focal interests within the discipline of landscape architecture.

Assessment 1: The professional program provides opportunities for students to pursue independent projects, focused electives, optional studios, certificates, and/or minors beyond the core curriculum.

F. Research and Innovation (Master's Level).

The professional program shall provide opportunity for graduate students to develop independent research and/or innovative projects to address current and future challenges by advancing the knowledge within the discipline.

Assessment 1: The professional program requires that theses or terminal projects exhibit creative and independent thinking and contain a significant research and/or innovation component.

G. Syllabi.

Appropriate syllabi shall be maintained and distributed for courses.

Assessment 1: Syllabi include course learning objectives, course content, and the criteria and the methods used to evaluate student performance.

Assessment 2: Syllabi identify the various levels of accomplishment students need to achieve to successfully complete the course and advance in the curriculum.

Assessment 3: Syllabi include a list of required and optional materials and equipment and provides an estimated cost as well as available shared resources or alternative access.

Assessment 4: Syllabi are complete, consistent, and readily accessible to all students throughout the period of course offering and delivery.

H. Curriculum Evaluation and Development.

The professional program shall define continuous, systematic, and well-documented curriculum evaluation procedures which include appropriate evaluation methods and metrics that allow the professional program to determine its effectiveness in advancing its learning objectives. The chosen evaluation methods and metrics shall track the professional program's progress in advancing its mission and goals, alignment with the Core Values, and promoting student competency.

Assessment 1: The evaluation procedures identify the professional program's evaluation methods and metrics, curriculum development, and the parties responsible for review.

Assessment 2: The evaluation examines, documents, and tracks the professional program's progress in advancing its mission and goals (including instruction, scholarship, and service), alignment with the Core Values, and promoting student competency.

Assessment 3: Evidence that the evaluation procedures are being implemented is provided. (Evidence may include reports or data summaries prepared for review, minutes of meetings at which results were discussed, action items that were identified, etc.)

Assessment 4: The professional program regularly assesses and documents its strengths and weaknesses related to this standard and identifies opportunities for improvement in accordance with the evaluation procedures.

Assessment 5: The professional program assesses and documents the effectiveness of curricular development and refinement in addressing issues identified through the evaluation process.

Assessment 6: Students participate in evaluation of the professional program, courses, and curriculum.

I. Academic Integrity.

The institution establishes and the professional program implements and demonstrates clear, specific policies related to student integrity and academic honesty in all course delivery methods.

Assessment 1: The professional program affirms that the student who takes an examination or submits project work is the same person who enrolled in the professional program and that the examination or project results will reflect the student's own knowledge and competence.

Standard 4: Student Outcomes and Experiences

The professional program shall prepare students—through educational programs, advising, mentoring, and other academic and professional opportunities—to pursue careers in landscape architecture upon graduation. The professional program shall foster the Core Values of these Standards and the knowledge, skills, and competencies embodied in the art and science of landscape architecture.

A. Student Outcomes.

The professional program shall qualify students to pursue careers in landscape architecture.

Assessment 1: Student work demonstrates the competencies required for entry-level positions in the profession of landscape architecture.

Assessment 2: Students demonstrate their achievement of the professional program's learning outcomes as defined by the professional program's curriculum and stated in Standard 3.

B. Student Advising.

The professional program shall provide students with effective advising and mentoring that recognizes and supports their individual circumstances and continues throughout their educational careers.

Assessment 1: Students receive effective advising regarding academic development.

Assessment 2: Students receive effective advising regarding career and personal development, the benefits of and pathways to licensure, general licensure requirements, and the need for continuing education.

Assessment 3: Students are made aware of professional opportunities, advanced educational opportunities, licensure requirements, and continuing education requirements associated with professional practice.

Assessment 4: Students have the opportunity to provide feedback on their academic experiences and their preparation for the landscape architecture profession.

C. Student Experiences.

In addition to curricular engagement, the professional program shall provide students with both an educational experience that considers the diverse needs and obligations of students, and also provides opportunities to learn about and grow within the profession of landscape architecture. The professional program shall provide students with an understanding of the role of the community in the profession and the profession in the community, the changing culture and environment of the profession, and competency regarding diversity, equity, and inclusion.

Assessment 1: The professional program provides students with opportunities to participate in service-learning activities which incorporate community-based collaboration and engagement, and which build cultural competence during their educational career.

Assessment 2: The educational structure of the professional program considers the varied needs and obligations of students, recognizes and affirms the importance of study/work-life balance, and seeks to overcome barriers to student success.

Assessment 3: Students have an opportunity to engage with various aspects of the landscape architecture profession and the skills required in practice.

Assessment 4: Students have an opportunity to provide input regarding the Program's efforts to foster an inclusive community and environment.

Standard 5: Faculty

The professional program shall advance its program mission and objectives by means of promoting the qualifications, academic position, professional activities, and individual professional development of its faculty and instructional personnel. A professional program shall have qualified, experienced, and diverse faculty and other instructional personnel to instill the Core Values of these Standards and the knowledge, skills, and competencies that students will need to pursue a career in landscape architecture. It shall also have equitable faculty workloads and faculty and staff compensation within the program, and overall support for career development that contributes to the success of the professional program.

A. Credentials.

The qualifications of the faculty, instructional personnel, and teaching assistants shall be appropriate to their roles.

Assessment 1: The faculty has a balance of professional practice and academic experience appropriate to the professional program's mission.

Assessment 2: Faculty assignments are appropriate to the course content, delivery methodology, and professional program's mission.

Assessment 3: Adjunct and/or part-time faculty (if present) are integrated into the professional program's administration and curriculum evaluation/development in a coordinated and organized manner.

Assessment 4: Faculty qualifications are appropriate to responsibilities of the professional program as defined by the institution.

B. Faculty Development.

The faculty members shall be continuously engaged in activities leading to their professional growth and advancement, the advancement of the profession, the mission, goals, Core Values, and effectiveness of the professional program, and curriculum and course delivery methodology.

Assessment 1: Faculty activities such as scholarly inquiry, research, professional practice, and service to the profession, university, and community are documented, peer-reviewed, and disseminated through appropriate media such as journals, professional magazines, community, and university publications.

Assessment 2: Teaching and administrative assignments allow sufficient opportunity for faculty to pursue advancement and professional development. Expectations for faculty workload and distribution of responsibilities (of teaching, research, service, and professional engagement) are similar to expectations in related academic units.

Assessment 3: Faculty seek and make effective use of available funding for conference attendance, equipment, technical support, and other professional needs.

Assessment 4: Faculty participate in university and professional service, student advising, and other activities that enhance the effectiveness of the professional program.

Assessment 5: Faculty members participate in a range of ongoing professional development opportunities, such as: career development; emerging issues in the profession; diversity, equity, inclusion, and cultural competency.

Assessment 6: The professional program provides resources to its faculty similar to the resources provided to other programs and departments in the institution.

Assessment 7: The professional program systematically evaluates the development, teaching effectiveness, and cultural competence of faculty and instructional personnel through a peer and program review process and uses the results for individual and program improvement.

Assessment 8: Programs regularly audit and update internal policies and procedures related to diversity, equity, and inclusion.

C. Faculty Retention.

The faculty shall hold academic status appropriate to the institution, have workloads, and receive compensation, mentoring, and support that promote productivity and retention.

Assessment 1: Faculty salaries and support are evaluated and are appropriate to promote faculty retention and productivity.

Assessment 2: The rate of faculty turnover does not undermine the mission and goals of the professional program.

Standard 6: Outreach to the Institution, Communities, Alumni, and Practitioners

The professional program shall maintain effective relationships with the institution, the public, its alumni, and practitioners in order to enhance the professional program and educate its constituencies regarding the profession of landscape architecture.

A. Interaction with the Institution and Public.

The professional program shall represent and advocate for the profession by interacting with the institution, the local community, practitioners, and the public at large.

Assessment 1: Community engagement and service-learning activities undertaken by students and faculty are documented and publicly disseminated on a regular basis.

Assessment 2: The professional program interacts with the institution to build awareness of the program; interact with both local, diverse, and historically underserved communities, and with the general public at large to advance knowledge and understanding of landscape architecture; all in a way that builds students' cultural competence during their educational career.

B. Interaction with Alumni and Practitioners.

The professional program shall engage alumni and practitioners as a resource to create partnerships that build the depth and capacity of the professional program.

Assessment 1: The professional program maintains or has access to a current registry of alumni that includes information pertaining to current employment, professional activity, postgraduate study, and significant professional accomplishments.

Assessment 2: The professional program engages its alumni and other practitioners in activities that include efforts to expand students' educational opportunities, mentoring, career advising and potential employment, curriculum review and development, service on a formal advisory board, fundraising, and continuing education.

Assessment 3: The professional program engages with alumni and practitioners in a way that reflects, supports, and promotes diversity, equity, and inclusion, assists in the recruitment of students with diverse backgrounds, and provides students with experiences that expand their cultural competence for interacting with diverse communities.

Assessment 4: The professional program engages with alumni and practitioners to provide opportunities for community engagement and service-learning for students, scholarly development for faculty, and professional guidance and financial support for the professional program.

Assessment 5: The professional program acknowledges and celebrates the significant professional accomplishments of its alumni and benefactors within the institution and the public at large.

Standard 7: Facilities, Equipment, and Technology

The professional program shall provide faculty, students, and staff access to facilities, equipment, libraries, and other resources necessary for achieving the professional program's mission and goals.

A. Facilities.

A professional program shall provide facilities and tools in designated, code-compliant space that enable achievement of the professional program's mission and goals and are adequately maintained to serve the professional and educational requirements of the faculty, students, and staff.

Assessment 1: Faculty, staff, and administration are provided with appropriate office, presentation, and meeting space.

Assessment 2: Students are assigned studio workspaces and have access to collaborative workspace adequate to meet the professional program's needs and designed to meet the diverse needs of students.

Assessment 3: Facilities are adequately maintained and in compliance with the Americans with Disabilities Act (ADA), the Life Safety Code, and applicable building codes. (Acceptable documentation includes reasonable-accommodation reports from the university ADA-compliance office and/or facilities or risk-management office.)

B. Information Systems and Technical Equipment.

The professional program shall provide to students, faculty, and other instructional and administrative personnel the software, information systems, and technical equipment needed to achieve its mission and goals.

Assessment 1: The information systems and technical equipment are sufficient, accessible, equitable, and available to serve the diverse needs of faculty and students.

Assessment 2: The frequency of hardware and software maintenance, updating, and replacement is sufficient.

Assessment 3: The professional program has a strategy for funding, maintaining, and advancing technology that supports learning.

C. Library Resources.

The professional program shall provide access to a digital and/or physical library and/or specialized resources sufficient to support its mission and goals.

Assessment 1: Collections are adequate to support the professional program and include access to a broad cross-section of publications, periodicals, research, and other materials that reflect the diverse social, cultural, economic, political, and scientific forces that shape the art and science of landscape architecture.

Assessment 2: Courses integrate library and other resources.

Assessment 3: Library hours of operation and access to library resources are convenient, accessible, and adequate to serve the diverse needs of faculty and students.