Return on Investment: An Appalachian State University Analysis

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Executive Summary

Appalachian State University's Office of Institutional Research, Assessment, and Planning (IRAP) conducted this report to analyze the university's performance in terms of Return on Investment (ROI) for its graduates. The project aims to evaluate how Appalachian State compares to similar public institutions, including both peer institutions and University of North Carolina (UNC) System schools. To do this, the project explores trends in alumni earnings relative to the cost of attendance. This analysis comprises part of IRAP's broader mission to promote data-informed decision-making that enhances institutional excellence and student outcomes.

Prompted by nationwide shifts in postsecondary enrollment and growing skepticism toward the value of higher education, this study addresses a pressing concern: is Appalachian State providing graduates with a return that justifies their financial investment? Using ROI data sourced from the Georgetown Center on Education and the Workforce (CEW), and complemented by institutional comparison metrics from the Integrated Postsecondary Education Data System (IPEDS), the analysis compares Appalachian State's performance across multiple horizons (10, 15, 20, 30, and 40 years post-enrollment) to select comparison groups formed either by membership to pre-defined groups (peer institutions, for instance) or similarity across certain institutional metrics (e.g., graduation rate).

Key findings reveal that while Appalachian State's ROI holds steady against UNC sister institutions, it consistently lags behind its peer institutions after the 10-year horizon. Visualizations and statistical tests (specifically Welch's t-test) indicate that Appalachian State's ROI mostly falls behind averages of comparable institution groups. This performance dip, particularly between 10 and 15 years post-enrollment, implies that alumni earnings may plateau sooner than those of graduates from comparable universities. This plateau could relate to the university's degree offerings, graduate employment sectors, or regional labor market characteristics.

Despite limitations in the Georgetown dataset, such as gaps in yearly coverage and the use of simplified earnings models beyond 10 years, the analysis provides a valuable snapshot of Appalachian State's ROI trajectory. Median-based comparisons and customized peer groups strengthen the study's relevance and mitigate distortions from data outliers. However, the absence of department-level ROI data, geographic wage analysis, and counterfactual earnings estimates limits the granularity of conclusions.

The findings raise important implications for Appalachian State. They suggest a need for further diagnostic research into long-term graduate outcomes, possibly at the departmental or industry level. The report also encourages future work to incorporate more complex ROI models and geographic labor data to understand and enhance graduate success. As public discourse continues to scrutinize the value of higher education, IRAP's analysis offers a foundation for ongoing strategic improvement, transparency, and student-centered planning at Appalachian State University.

Organization Background

Appalachian State's Office of Institutional Research, Assessment, and Planning (IRAP) functions as a multi-pronged center for data-based decision making. It both serves as a source for university data on demand and conducts projects and studies to aid the university through data analysis and exploration. IRAP's primary mission concerns delivering data-based information to the Appalachian State community to produce decisions positively impacting the university's

continued success and improvement. It adheres to the following core values in its work: Integrity, Accuracy, Impartiality, Collaboration, Continued Improvement, and Excellence. To this end, IRAP has involvement in areas as varied as the university's Climate Action Plan and the processing of student course evaluations. Work for IRAP involves cooperation with numerous other university offices in data spanning multiple disciplines, as well as presenting project findings to key figures in the university administration to inform on policy decisions and express data-backed recommendations.

Business Problem and Context

Shifts in university enrollment demographics have introduced the need to reevaluate higher education's place in society. Notably, a 2023 study concluded that fewer young people have attended college directly after completing high school since 2011 (Fry, 2023). This growing disconnect between young people and post-secondary institutions prompts an urge to establish the worth of such an investment. University attendance bears a substantial financial burden, and it is in the interest of higher education institutions to justify the investment into their services.

As one such higher education institution, Appalachian State University possesses an interest in resolving these concerns over higher education value. Beyond justifying itself as a worthwhile investment, the university can also offer a window into student outcomes to optimize the institution's core value of student success. Examining the return on students' investments, especially in comparison with other institutions, helps ensure that the university's alumni are prospering. If reports reveal evidence to the contrary, this would necessitate diagnostic work to provide insights on where the university can improve, and how students' outcomes can be improved.

Project Goals and Scope

This report will explore and contextualize Appalachian State University's performance in return on investment (ROI) relative to comparable institutions, especially predetermined groups such as peer institutions on the latest Summer 2025 peer list and fellow UNC (University of North Carolina) System schools. Although exact methods of calculating ROI differ, in simple higher education terms it seeks to numerically extract the financial benefit of a degree by subtracting cost from career earnings. The notion of ROI has gained traction in the higher education community in recent years, as increasing public discourse centers around the cost of higher education and widespread skepticism over its ultimate value relative to cost (Sigelman, 2024). As part of IRAP's commitment to promoting university excellence and improvement, the office seeks to compile a report on ROI to evaluate the university's performance to establish points of comparison and contrast to similar institutions–namely sister schools in the UNC System and peer institutions, but also potentially other groups possessing similar traits.

In its purest form, this project will serve as an institutional frame of reference rather than a great aid for any narrower or wider focus. Potentially, though, other institutions could simply replicate the methodology described here for their own studies, given that Appalachian State represents only one of many institutions for whom ROI may be relevant. Insofar as this report does not outwardly benefit anybody outside of Appalachian State, this project does not investigate constituent parts of the university at a deep level either. While ROI may apply to specific departmental investigations, the available data explored here only offers generalized metrics by institution.

Finally, this project seeks to serve as a step that may be built upon when aiding university operations that maximize institutional ROI. Through feedback from IRAP Interim Director Rick

Sears and the creation of Tableau dashboards accessible to IRAP and the university administration, the ideal time scope of this project's relevance extends further into the future than its date of completion. It is anticipated that future researchers may freely add updated data to existing work, or that university decision-makers may continue referencing this report's main deliverables.

Best Practices and Literature Review

As ROI has increased in popularity as a metric to quantify higher education value, various researchers have adopted different approaches in both calculating and interpreting it. A Bipartisan Policy Center (BPC) examination illustrates this, exploring three different bodies' methods and results in extracting ROI (Wielk & Stein, 2024). Here, think tank Third Way developed a measurement of "Years to Recoup Net Cost" in 2020, dividing the total average net price of attendance by the difference between post-enrollment earnings and the typical salary of a high school graduate in that state. Meanwhile, in 2021 the Foundation for Research on Equal Opportunity (FREOPP) opted for a median ROI measurement based on the difference between "estimate earnings [post-degree]" and the sum of "counterfactual earnings"--estimated hypothetical earnings without the degree–and net college costs. Completing the set, the BPC offers a 2022 calculation via subtracting total average net price of college attendance from "Lifetime College Earnings Premium", or the positive "earnings bump" from attending college for the median student. While more similar to each other than to the Third Way measurement, the FREOPP and BPC differ in that the BPC directly calculates counterfactual earnings via median earnings for high school graduates, while the FREOPP estimates these values based on demographic details and other correlated variables. These latter two models also deepen in complexity by taking other factors into account and adjusting for them, such as completion rates.

Crucially, these three discussed ROI models conclude different findings based on their differing methodologies. As well as the ROI calculation methods discussed, the FREOPP only incorporated data by the degree program level in contrast to the BPC's institutional focus. Third Way's approach, with sections for both institution and degree program, concluded with 2023 data that "55% of four-year institutions will recoup the costs of their enrollment within five years of graduating". The FREOPP's work in 2021 led to finding that "72% of programs at bachelor's degree-granting institutions generate a positive ROI for the typical graduate". The BPC full model indicates from 2022 data that "97.6% of public four-year institutions, 92.0% of nonprofit four-year institutions, and 51.7% of for-profit four-year institutions provide a positive ROI". This BPC statistic, especially, provides a far more optimistic outlook than FREOPP in an attempt at measuring four-year institution ROIs. Thus, focus on ROI can vary from the institutional level to program level, and take the angle of approximating the average number of years to recoup college costs or develop findings from a raw ROI value. All of these models possess a value in the interpretability of their results, but their success underlines the necessity for specificity when discussing ROI in higher education.

These relatively diverse models provide multiple insights into ROI analysis best practices. First of all, analysis emerging from one method of capturing ROI ought to maintain the caveat through each conclusion that model results vary widely depending on method used. Well-funded sources, in this case the BPC, FREOPP, and Third Way, diverge to such an extent over approach and results that ROI analysis hinges on these methodological specifications. Secondly, effective ROI measures must delve beyond a basic difference between degree cost and post-degree wage. These institutions, though inventing radically different models, all factored in crucial ROI calculation elements that, if not "best" practice, certainly indicate "good" practice:

the formation of ROI as a measure of *improvement* over the alternative to a higher education degree rather than simply the earnings from such a degree subtracted by its cost.

Perhaps uncharacteristically, the data in this report does not feature this method of calculation, but instead opts for raw post-degree earning opposed to degree cost. This distinction may not greatly shift results beyond subtracting a lower amount from post-graduate earnings, but the variation of estimated GED-level salaries may vary by state or other factors. Considering this context becomes important with the application of resources used in this report, since studies adopting this more raw, simple approach lose efficacy in analyzing net benefits from a degree with the loss of accounting for expected earnings without this degree. However, this factor loses significance for goals surrounding comparing institutional ROI statistics to one another.

Taking median measurements also emerges as a best practice within preexisting ROI studies such as those from the FREOPP and the BPC, a practice replicated in this report. One concern over calculating the mean as a measure of average ROI is the potential for outliers to lead to reports of gains inaccurate for the majority of the population. To emphasise a more holistic and representational measure of average across a dataset of examined students, recording the median is preferred in order to dispel these outlier threats.

Past discourse centering on ROI has delved more deeply or even broadly than evaluations at the singular institutional level to identify characteristics that typically bolster the metric. For instance, the FREOPP notes, among numerous conclusions based on its own data analysis and definition of ROI, that the field of study bears more weight than institutional choice in ROI (Cooper, 2024). Furthermore, this study notes a positive relationship between on-time completion rates and ROI, as well as a less clear positive relationship between ROI and tuition costs. This report explores both of these areas by comparing Appalachian State to schools of similar graduation rate and cost. However, this report does not extend to areas of interest such as the prevalence of STEM or medical programs within an institution. These are cited by one of Georgetown's researchers as clear upward drivers of ROI (Nadworny, 2022). These existing connections between past research and this project strengthen the prospect of delivering firm insights regarding university performance by examining ROI across these metrics, though imperfections remain in the effort to cover all relevant avenues and holistically evaluate Appalachian State's performance.

Data Collection

The IRAP leadership identified an ROI data source from the Georgetown Center on Education and the Workforce (CEW), which provides ROI data across over a decade from thousands of American degree-granting institutions. Georgetown, in turn, credits College Scorecard for its own data source. College Scorecard serves as a postsecondary education data source of the United States Department of Education. Accessing the complete Georgetown dataset required an emailed request following directions on their website, after which the data became downloadable via comma-separated value (CSV) file (see Appendix 1). The Georgetown data includes ROI measurements from the 2009-10 academic year to 2021-22, but without readings from 2010-11 and all academic years from 2013-14 to 2017-18. For undisclosed reasons, ROI collection did not take place in these years.

The Georgetown CEW data applies slightly different ROI calculation methods depending on an institution's primary degree. Georgetown's methodology for bachelor degrees, which are the focus of this report relevant to Appalachian State University, adds year 6, year 8, and year 10 median earnings provided by the College Scorecard along with years 7 and 9–estimated from the

average change in the earnings from year 6 to 8 and 8 to 10 respectively. In Georgetown's calculations, each year represents the passage of time post-enrollment, rather than post-graduation. After addition, the equation subtracts 5 times the average net price–described by the College Scorecard as the "net amount paid to attend a particular institution by students who are receiving federal financial aid" (Georgetown, 2025). Georgetown also estimates ROI for horizons beyond this calculation for 10 years, but assumes earnings remain the same after this threshold. Thus, estimates at the 15-, 20-, 30-, and 40-year horizons offer conservative figures given the tendency of earnings to increase over the course of a career.

Data from the Integrated Postsecondary Education Data System (IPEDS) joined with the Georgetown data to foster the creation of customizable groups based on certain metrics. This source was chosen on the recommendation of IRAP Interim Director Rick Sears. IPEDS allows for custom data selection and export on its website. For this project, all IPEDS data was downloaded based on most recent readings (see Appendix 3 for specific details on the selected data). The exact recording time of this data typically varied by variable. This report compared data recorded more recently than much of the Georgetown ROI readings to these earlier ROI values under the assumption that university metrics such as graduation rate and enrollment numbers remain relatively stable over time.

This report encountered difficulty regarding unequal sample size of comparison groups when drawn from single variables on the IPEDS website. This report prioritized selecting institutions for group comparisons in a manner ensuring a sufficiently large sample size, certainly no lower than the range of 10-12 institutions already grouped for UNC and peer analysis. Each group stemmed from a trial-and-error process to ensure similar institutions to Appalachian State appeared in each comparison group without too selective or inclusive criteria.

Data Cleansing

All data files used for this project were downloaded as CSV files, and read into RStudio through the 'readr' package. The 'dplyr' and 'tidyr' packages then facilitated data manipulations. For initial analysis, peer and UNC comparison groups were formed by the manual creation of dummy variables in the Georgetown dataset–one variable for each group across all data indicating "1" for membership and "0" for non-membership. The list of former peers on the Appalachian State website also joined the dataset through this method several weeks into the analysis. Although Appalachian State naturally serves as a constituent of both the UNC System and its own peer group, this report excludes it for most analysis to instead examine the relationship between Appalachian State and *all other* peer and sister schools.

Georgetown's ROI data included time measured as an academic year such as "2009-2010". In order for software to recognize these columns as numerical year variables, a mutated column extracting the first year of each reading was created as `Start Year`. This especially helped within Tableau for the creation of visualizations.

One challenge faced revolved around the integration of IPEDS data into the original Georgetown dataset. Each IPEDS dataset incorporated one specific feature of similarity between the schools chosen and Appalachian State. This process emerged from trial and error, allowing an arrival at the conclusion that conducting a multivariate search for similar schools to form fewer IPEDS datasets would become too specific, and that comparisons would be clearer when separated by one variable of comparison. To this end, all IPEDS datasets were joined to each other according to automatic criteria, and then to the Georgetown data by institution name. The data was then filtered to only include schools listed as "public" with predominant degree as

"Bachelor's", to ensure adherence to the report's target of delivering results relevant to Appalachian State.

A more unique challenge surrounding confusion over multiple institutions named "Lincoln University" resulted in those schools' deletions from the data considered. One row from the CSV file drawn directly from IPEDS indicated a university with similar financial aid characteristics to Appalachian State. However, as there are multiple universities named Lincoln University in the country and the IPEDS data did not provide a clear indication as to which university it was referencing, deletion represented the best path forward.

Data Storage

During the progress of this project, all raw data and work was stored on IRAP's local servers. This included the raw, structured data on CSV files from Georgetown and IPEDS as well as RStudio and Tableau work files. After completion, the project will be accessible to all of IRAP on the office's "M Drive".

Fortunately, all data employed in this analysis is publicly available and thus introduces minimal privacy concerns. Although accessing the full Georgetown dataset required emailing the Georgetown CEW office, the provider required no proof of identity. Likewise, accessing the IPEDS data brought into this project requires only Internet access and an ability to download the desired data.

Data Analysis

This report's main target focuses primarily on descriptive analysis, as it analyzes past ROI values to better understand data behavior that has already occurred. Specifically, this analysis breaks down Appalachian State's ROI readings relative to comparable public bachelor-granting institutions on a year-by-year basis. Any diagnostic conclusions drawn from this report are outside the scope of the analysis itself, and thus merely speculative. Further reports and analytical studies focused on root causes behind ROI trends–and incorporating specific hypotheses regarding these trends–will provide more concrete diagnostic, predictive, and prescriptive work beyond this report's offering.

Exploratory analysis concerned establishing an evaluation for Appalachian State's performance at a baseline. This was achieved by filtering Georgetown data in RStudio to exclude all but public institutions specializing in Bachelor's degrees, before establishing Appalachian State percentile values for each horizon of every available year. Percentiles provide an easily interpretable manner of gauging Appalachian State's relative performance in this metric across the horizons and years available. It removes the potential for issues when reporting raw rankings in cases where data for other institutions may be incomplete, and offers a non-technical, basic starting point for more expansive analytical insights.

In comparing ROI data groups, the Welch *t*-test represented the primary chosen method. This test provides statistical backing for differences between two data groups by comparing group means. Crucially, especially in cases where Appalachian ROI is compared to a group comprising multiple different institutions' ROI values, Welch does not require the assumption of equal variances and equal sample sizes prevalent in the Student *t*-test. Thus, applied here in RStudio with the "t.test()" function, Welch allows for surface-level conclusions regarding ROI group similarity and dissimilarity. This level of statistical backing is necessary for any analytical project regardless of target audience, as it leads to a more formal validation of research conclusions.

Initial visualizations sought to compare Appalachian State's ROI across the data to peer institutions and UNC sister schools, as well as former peers. This led to the creation of an averaged Peer total and UNC total across each horizon for each available year. This relationship was explored in bar charts incorporating individual institutions including Appalachian State within each group, and then in line graphs. While sorted bar graphs allow a more structured hierarchical perspective of the data, line graphs better capture this data's nature by permitting an automatic account of change over time rather than having to make this shift manually. Line graphs became the most key visualizations to convey data trends in this project due to Microsoft Tableau's capacity to formulate dashboards with dynamic variables compared across any horizon value of choice over the full timespan of the dataset.

After this, the incorporation of the IPEDS data allowed for more complex visualizations. Following a consultation with IRAP Interim Director Rick Sears, further analytical work targeted a visualization allowing both Peer and UNC groups to be compared to Appalachian State along with groups formed from IPEDS. This approach led to a more dynamic line graph allowing a toggle between different horizons and different custom group comparisons–whether comparing Appalachian State to the UNC System or schools with different graduation rates.

Further analysis will expand and optimize this setup, using feedback to deliver useful comparisons across more groups, or honing existent methods to deliver more effective insights. The latter part of this project could also examine diagnostics as to *why* certain comparisons reflect Appalachian State in a more flattering or less flattering light.

Results and Findings

Appalachian State takes its place as one of 591 public, predominantly Bachelor-granting institutions covered by the Georgetown ROI dataset. The following table visualizes Appalachian State's place in the overall ROI return hierarchy of the United States (Figure 1). Main takeaways include a peak in performance at the 2020-21 academic year across all horizons and a low point in 2014-15. At any given time and horizon, Appalachian State outperforms between 28% and 47% of public 4-year institutions in ROI.

Appalachian State ROI Percentiles (public 4-year only)

	Year								
Horizon	2009-10	2011-12	2012-13	2013-14	2014-15	2018-19	2019-20	2020-21	2021-22
10	0.4634	0.4270	0.4049	0.3463	0.2839	0.4247	0.4501	0.4643	0.3956
15	0.3734	0.3315	0.3265	0.2963	0.2930	0.4029	0.4200	0.4436	0.3938
20	0.3602	0.3184	0.3134	0.2963	0.3040	0.3829	0.4143	0.4436	0.3993
30	0.3452	0.3052	0.3153	0.3000	0.3114	0.3757	0.4011	0.4436	0.3902
40	0.3358	0.2940	0.3190	0.2981	0.3205	0.3702	0.3974	0.4398	0.3902

Figure 1: Appalachian State ROI Percentiles (among public 4-year schools)

Initial analysis expanded beyond basic comparisons across all available institutions, centering instead upon the comparison of Appalachian State's ROI readings in the Georgetown data to predefined institution groups–namely peer institutions and UNC System sister schools. Early *t*-tests conducted within RStudio concluded no demonstrable differences between Appalachian State's ROI readings and those of the UNC group (Figure 3) within the Georgetown

data. However, the same process found statistically significant differences between Appalachian State lagging behind the average peer list school for all horizons (15, 20, 30, 40) beyond the initial 10 years at *p*-values below 0.01 (Figure 2), with a similar relationship to former peer schools. These comparisons are drawn from ROI readings taken between the 2009-10 academic year and 2021-22.

```
--- Horizon: 10 ---
p-value: 0.732106
Mean ROI - App State: 153430.3
Mean ROI - Peer group: 151248.5

--- Horizon: 15 ---
p-value: 0.009017298
Mean ROI - App State: 403234.7
Mean ROI - Peer group: 439562.6

--- Horizon: 20 ---
p-value: 0.0009529328
Mean ROI - App State: 653039.1
Mean ROI - Peer group: 727876.7

--- Horizon: 30 ---
p-value: 0.0001703489
Mean ROI - App State: 1152648
Mean ROI - Peer group: 1304505

--- Horizon: 40 ---
p-value: 8.4112e-05
Mean ROI - App State: 1652257
Mean ROI - Peer group: 1881133
```

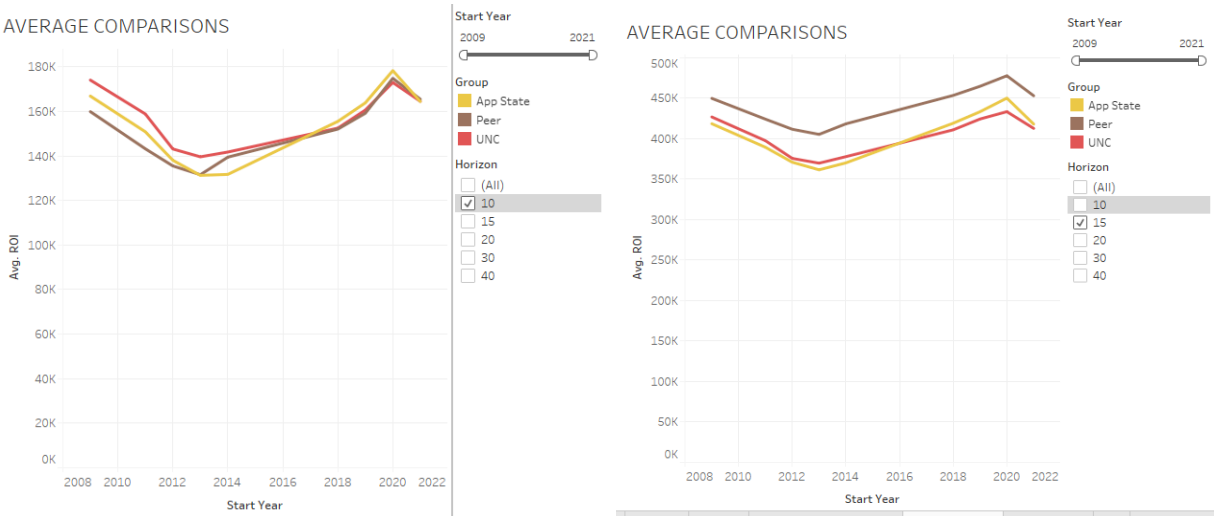
```
--- Horizon: 10 ---
p-value: 0.08968955
Mean ROI - App State: 153430.3
Mean ROI - Former Peer group: 164875.2

--- Horizon: 15 ---
p-value: 0.0003018088
Mean ROI - App State: 403234.7
Mean ROI - Former Peer group: 460946.7

--- Horizon: 20 ---
p-value: 5.230267e-05
Mean ROI - App State: 653039.1
Mean ROI - Former Peer group: 757018.2

--- Horizon: 30 ---
p-value: 1.45603e-05
Mean ROI - App State: 1152648
Mean ROI - Former Peer group: 1349161

--- Horizon: 40 ---
p-value: 8.717071e-06
Mean ROI - App State: 1652257
Mean ROI - Former Peer group: 1941304
```

```
--- Horizon: 10 ---
p-value: 0.6406444
Mean ROI - App State: 153430.3
Mean ROI - UNC group: 156447.7

--- Horizon: 15 ---
p-value: 0.9843437
Mean ROI - App State: 403234.7
Mean ROI - UNC group: 402987.3

--- Horizon: 20 ---
p-value: 0.8544181
Mean ROI - App State: 653039.1
Mean ROI - UNC group: 649526.9

--- Horizon: 30 ---
p-value: 0.7568348
Mean ROI - App State: 1152648
Mean ROI - UNC group: 1142606

--- Horizon: 40 ---
p-value: 0.7174813
Mean ROI - App State: 1652257
Mean ROI - UNC group: 1635685
```

Figures 2, 3, and 4: Welch's *t*-tests between Appalachian State and peers (left), former peers (center), and UNC (right)

These results provide an initial understanding of Appalachian State's place in the ROI sphere. While the institution fails to stand out amidst UNC schools in any horizon, it falls behind the peer group after the 10-year horizon. Conducting the same test on the former peer group revealed similar results, with statistically significant results pointing Appalachian State lower than former peers after the 10-year horizon. In less technical terms, these results indicate that some shift occurs between 10 years and 15 years post-enrollment that sees Appalachian State alumni experience fewer salary increases than peer institution alumni.

This peculiarity in performance was explored further by visualizations in Microsoft Tableau. Firstly, bar charts noted the ranking of Appalachian State's ROI in both peer and UNC groups. However, line graphs expanded beyond bar charts to add more visual flexibility and allow for automatic time comparison without requiring a manual selection of year. Standout characteristics once more stemmed from the contrast between the 10-year horizon (Figure 5) and all other calculated horizons (Figure 6). Although only one horizon after 10 years is provided here (15, in this case), all horizons following 10 years exhibit the same characteristics: Appalachian State pulls away from the UNC average in approximately 2018 and peaks in relative performance in the 2020-21 academic year, but remains firmly behind peer institutions. However, the 10-year horizon exhibits a far closer relationship between all three groups. All horizons display decreases from the data's start in 2009 until 2013-14, before a sharp increase thereafter punctuated by another slight decrease in 2021-22.



Figures 5 and 6: Line graph showing Appalachian State ROI performance relative to UNC and Peers at 10-year horizon (left) and 15-year horizon (right)

To gain firm statistics behind Appalachian State's performance relative to peer institutions and the overall UNC System, tables made in RStudio compared Appalachian State's ROI by horizon and academic year to these groups by measuring Appalachian State's ROI percent above or below the group's own average. For instance, a value of -5 on the table indicates Appalachian State logging an ROI average 5% lower than the UNC average.

	horizon	2009-10	2011-12	2012-13	2013-14	2014-15	2018-19	2019-20	2020-21	2021-22
1	10	-3.877	-4.735	-3.332	-5.613	-6.668	1.858	1.886	2.877	-0.066
2	15	-1.838	-1.910	-1.183	-2.073	-1.905	1.864	1.981	3.626	1.200
3	20	-1.316	-1.206	-0.678	-1.251	-0.809	1.865	2.003	3.813	1.515
4	30	-0.940	-0.704	-0.325	-0.678	-0.047	1.866	2.019	3.946	1.740
5	40	-0.789	-0.503	-0.185	-0.452	0.253	1.866	2.025	3.999	1.830

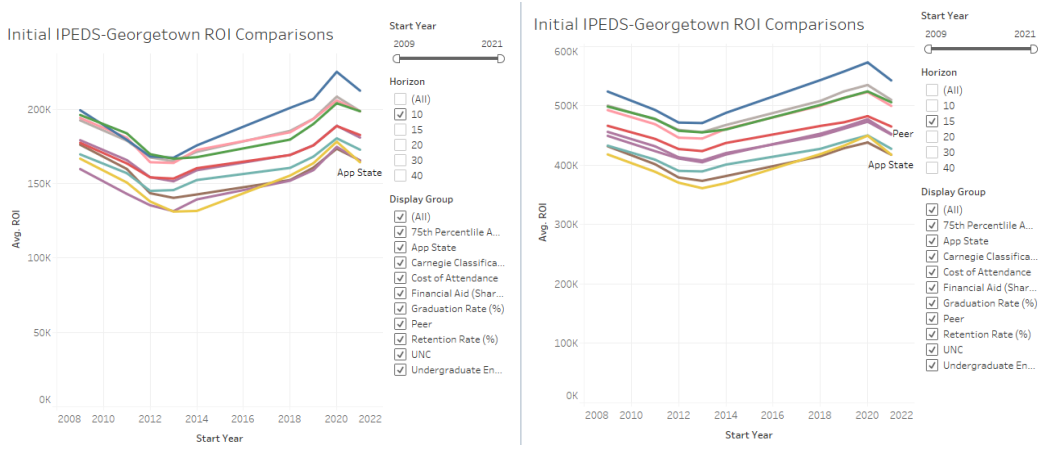
Figure 7: Appalachian State's ROI performance relative to UNC System average (% over or under)

	horizon	2009-10	2011-12	2012-13	2013-14	2014-15	2018-19	2019-20	2020-21	2021-22
1	10	3.954	4.827	1.695	-0.204	-5.073	2.060	2.648	1.795	-0.571
2	15	-6.372	-7.496	-9.083	-9.902	-10.591	-6.935	-6.190	-5.276	-7.075
3	20	-8.633	-10.038	-11.236	-11.805	-11.703	-8.767	-8.037	-6.874	-8.541
4	30	-10.182	-11.747	-12.670	-13.066	-12.445	-9.996	-9.284	-7.979	-9.553
5	40	-10.786	-12.408	-13.222	-13.550	-12.731	-10.469	-9.767	-8.412	-9.950

Figure 8: Appalachian State's ROI performance relative to peer group average (% over or under)

These tables add a new dimension to comparisons, bringing Appalachian State's isolated connection to each group of interest into focus. For instance, the table underlines Appalachian State's steady improvement in performance against the UNC System from the data's start to a culmination in the 2020-21 academic year (Figure 7). Performance also peaked in 2020-21 relative to peers (Figure 8), except for a 10-year horizon peak far earlier in 2011-12.

The addition of IPEDS data allowed for an expansion of this concept to include the initial predefined groupings with customized groupings on the same Tableau interface. As with the other visualizations, each new horizon after 15 years post-enrollment exhibits relative homogeneity with the 15-year horizon (Figure 10). This interface suits a user dynamically selecting and deselecting comparison groups from the graph, but for the purposes of this report is shown in full, static form.

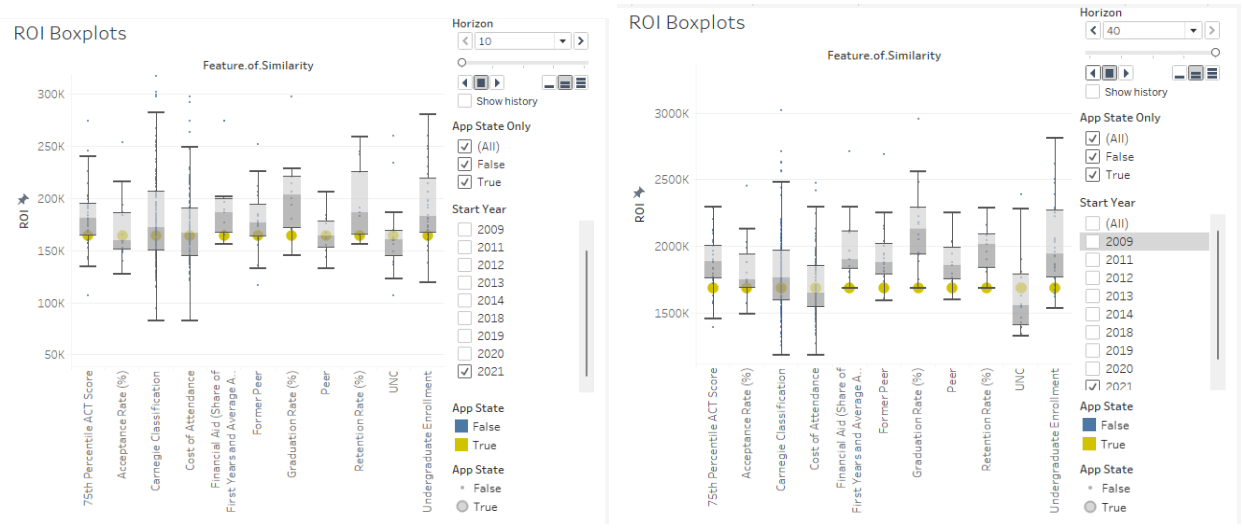


Figures 9 and 10: Full line graph incorporating Appalachian State (the gold line), peer, UNC, and custom IPEDS groups' ROI averages over 10-year horizon (left) and 15-year horizon (right)

Without delving too deeply into a frenetic ranking of an ever-growing list of comparison groups, Appalachian State only competes with its peer group and the UNC System in ROI over its 10-year horizon (Figure 9). All IPEDS metrics incorporated into the analysis at this stage remain firmly ahead, except for the "Cost of Attendance" comparison group in later horizons (shown in light blue on the above line graphs). Furthermore, as also shown more clearly in Figure 8, the peer group even leaves Appalachian State firmly behind in later horizons (Figure 10). This all provokes concern, showing Appalachian State lagging behind in ROI rankings across most of this report's comparison groups.

Corresponding with Appalachian State's lower performance relative to all introduced comparison groups, expanding the *t*-test approach of Figures 2, 3, and 4 to all new comparison groups led to statistically significant differences between Appalachian State and almost all IPEDS-introduced groups at every horizon. The only exception occurred within schools grouped by similar in-state and out-of-state Cost of Attendance numbers (see Appendix 3)–with *t*-test results involving this group never descending below the 5% significance level for any horizon. Within the majority of cases demonstrating high confidence for differences between Appalachian State and comparison groups, Appalachian State possessed an average ROI lower than the institution group each time.

Another effort to visualize Appalachian State's relationship with comparison groups by ROI led to the creation of a boxplot system in Tableau (Figures 11 and 12). This approach seeks to counterbalance the line graph system by offering a more nuanced, if more complex, view to how Appalachian State performs relative to comparison groups by a customizable combination of years and horizons. Importantly, this piece of analysis includes Appalachian State in the comparison groups to allow for its display within each individual boxplot. In the dashboard, Appalachian State's ROI readings are designated by a distinctive yellow color and larger size.



Figures 11 and 12: Example usage of Tableau boxplot interface, in this case comparing 10-year and 40-year ROI horizons between institutional comparison groups in the 2021-22 academic year

Seeing where Appalachian State falls against the comparison point of institution groups' 25th, 50th, and 75th percentiles allows for several key takeaways. First of all, although Appalachian State does not perform well against comparison group averages, it rarely drops below the 25th percentile in the 10-year horizon (as exhibited by Figure 10, detailing the 2021-22 academic year). However, the school fades within its group for later horizons, even frequently appearing at the tail end of comparison groups built based on financial aid characteristics, graduation rates, and retention rates (Figure 11). This interactive visualization compounds earlier evidence for Appalachian State alumni earnings plateauing at greater rates than comparable institutions, starting at approximately 10 years post-enrollment.

Limitations and Challenges

Limitations and challenges to this point in the analysis stem from limitations on the report's interpretability. Although a well-regarded metric with value, ROI should not–at any cost–be the sole indicator of an institution's worth. If a student bears a passion for the arts over a STEM field, for instance, then the ROI outlook for their preferred field is likely worse. However, ROI does not account for the more human, passion-related aspect of a career. Thus, any relation of ROI to the overall standing of a university must keep this caveat in mind.

As well as conceptual limitations to ROI, this analysis also faces limitations from its data. Firstly, from the initial Georgetown dataset providing all ROI readings, the data misses several academic years between 2009-10 and 2021-22 at irregular intervals, restricting more nuanced attempts to extrapolate trends in ROI. For instance, this analysis fails to introduce any data between the 2014-15 and 2018-19 academic years due to missingness in the original collection process. Although not fully detrimental to the border targets of this report, this failing impacts the continuity of visualizations and reduces the amount of data from which conclusions may be made.

Additionally, datasets built from IPEDS for specific comparison groups lack continuity due to their differing amounts of members. This makes certain group averages more susceptible to outliers than others. Even with more stringent group creation, uniform group membership totals never remained a possibility due to the makeup of IPEDS selection criteria. Creating

groups matching the Appalachian State University Graduation Rate and Retention Rate metrics provided by IPEDS instantly arrives at groups of 13 and 12 institutions, respectively, without any way of narrowing or broadening selection criteria beyond whole percentage marks.

Implications

At this stage, considering the concerningly poor results in relative ROI performance to similar institutions from an Appalachian State perspective, diagnostic work could be launched to better explain this poor performance across ROI horizons–especially the more distant ones. For one hypothesis, perhaps the high volume of teaching students enrolling and graduating from Appalachian State weakens institutional ROI due to this industry's difficulty in achieving high pay. Furthermore, this could also explain the lack of pay rises that would strengthen Appalachian State at the 15-year horizon, for instance. The decreased performance of Appalachian State compared to, say, peers as the horizon increases indicates far inferior Year 10 (post-enrollment) earnings than the likely closer Year 6 earnings. This supposition originates from the calculation of ROI by Georgetown for this study, which treats earnings as fixed after Year 10, making this year's earnings the final factor in deciding ROI measurements for the next horizons. Seeing that Appalachian State generally performs slightly better in the 10-year horizon across most comparisons before fading in later horizons, this underlines the fact that gains between Year 6 and Year 10 for graduates do not materialize.

Generally speaking, Appalachian State performance relative to comparable institution groups appears to peak in the 2020-21 academic year–at least from the data available for this report. This likely does not reflect recent university policy, since this measures students a minimum of 10 years post-enrollment, but could reflect changes or differences in the university that affected students enrolling in 2010 or earlier. Furthermore, this could reflect an upturn in offered wages for the job market most popular with Appalachian State graduates, likely positions in the nearest commercial centers of Charlotte, the Research Triangle, or around Boone itself. This type of thinking could apply for similar data points exhibiting upwards or downwards shifts in Appalachian State ROI, but naturally all conclusions that cannot yet be substantiated.

Especially if further research supports this analysis's notion that Appalachian State graduates full behind peers after the first decade post-enrollment, Appalachian State would likely seek clarification in the form of peer group collaboration. If possible, more detailed data could be exchanged between universities in order to obtain a more clearer picture of drivers behind these differing ROI numbers across multiple horizons. This specific, targeted exchange could prove mutually beneficial for the entire peer group, and is a more realistic, likely proposition than attempting collaboration with groups similar across one or two IPEDS metrics.

IRAP anticipates sharing this analysis with university administration as part of an effort to better understand institutional ROI trends. The Tableau dashboards created through this process may later be improved or expanded with more recent data or other visualization techniques. The concerningly low performance of Appalachian State indicates the high likelihood of more diagnostic, predictive, and prescriptive work to learn more about the reasons behind these trends and strengthen university performance moving forward.

Recommendations and Next Steps

As noted in the "Limitations" section, this report only represents a starting point in a longer journey to fully evaluate how well Appalachian State equips its graduates for successful careers. Further work should seek to add nuance to findings discussed above by launching a

detailed analysis of ROI at a departmental level, then comparing the return of Appalachian State departments to similar departmental ROI information from other institutions. If such data remains unavailable due to privacy or scarcity, then Appalachian State could launch a study featuring industry-based data to break down higher- and lower-income college degrees and how they comprise Appalachian State.

Beyond the departmental level, further research could consider university location and how it potentially relates to ROI. Imperfect correlations between tuition cost and wages in the geographic area most popular for graduates from an institution may cause certain institutions to benefit from this unrelated factor. Introducing data that considers job markets more thoroughly may address this concern, since it goes unaddressed in this report. Incorporating available geographic information about these institutions and combining this data with any nuances about wage trends for institutions' graduates by geographic area would presumably help solve this gap in analysis.

As noted in the "Literature Review" section, many bodies possess distinct definitions of ROI that differ from the one drawn from the Georgetown dataset utilized for this project. One key factor involved the calculation of horizons beyond 10 years post-enrollment by conservatively assuming earnings remain stagnant past this point. Although this method was likely employed for purposes of simplicity, further projects should absolutely make use of any datasets more accurately calculating later ROI horizons–if such data becomes available. Away from this specific scruple, Appalachian State's ROI performance could also be calculated by factoring in *improvement* over estimated earnings without higher education as opposed to raw earnings versus cost. Many ROI studies take this approach, and considering this nuance at a regional level would add valuable depth to this analysis.

Beyond ROI itself and its measure of median earnings across all of an enrolled cohort, perhaps future studies could consider earnings spread. Though the median calculations generally used for ROI reports boast more resistance to outliers than mean calculations, Appalachian State could attempt to view their former students from a different perspective. Specifically, research could quantify the share of a cohort earning above or below a certain threshold, or compare and contrast alumni averages to industry averages at the same stage within a career. Fully understanding ROI does not represent a final mark in the road to understanding how well university alumni perform in their careers after graduation. Much work remains to fully capitalize on available data to optimize university effectiveness in delivering the most quality guidance possible to thousands of Appalachian State University students.

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Note on the usage of AI:

This report includes an executive summary greatly influenced, with substantial human edits, by the free version of ChatGPT (https://chatgpt.com/?model=auto) after entering the rest of the report as well as the prompt: "Write an executive summary of one page or less, stressing that this report is not final".

Appendix 1: Georgetown CEW Dataset

In *Ranking 4,600 Colleges by ROI (2025)*, there are 211,590 rows and 8 columns (`year`, `institution`, `city`, `state`, `predominant_degree`, `control`, `horizon`, and `ROI`).

1. `year` is the academic year (i.e. 2009-10).
2. `institution` is the institution name
3. `city` is the city name where the institution is located
4. `state` is expressed as a two-letter code, while institution and city names remain unabbreviated.
5. `predominant_degree` classifies the predominant university degree type (e.g. "Bachelor's")
6. `control` helps classify the university control type (e.g. "Public")
7. `horizon` is the post-enrollment timespan in years (expressed as 10, 15, 20, 30, or 40)
8. `ROI` lists the ROI recordings for each institution within the given year and horizon.

Appendix 2: **Pre-defined comparison groups**

The following list of institutions comprised the peer comparison group. This group is the current peer list pending System Office approval as of June 2025. Appalachian State did not appear in the group to compare to itself. Likewise, the former peer group was also extracted from the same page.

Peers (10 total): Coastal Carolina University, College of Charleston, Georgia Southern University, Grand Valley State University, Illinois State University, James Madison University, Miami University-Oxford, West Chester University of Pennsylvania, Western Michigan University, and Western Washington University

Former Peers (18 total): Binghamton University (also known as SUNY at Binghamton), Bowling Green State University-Main Campus, California State University-Chico, College of Charleston, Eastern Illinois University, Indiana University of Pennsylvania-Main Campus, James Madison University, Miami University-Oxford, Minnesota State University-Mankato, Rowan University, Saint Cloud State University, Sam Houston State University, Towson University, University of Northern Iowa, University of Wisconsin-La Crosse, West Chester University of Pennsylvania, Western Illinois University, Western Washington University

The UNC System group was taken from the UNC system website at northcarolina.edu. Again, although Appalachian State University appears in this group, for the purposes of comparison it was excluded. Also, although the North Carolina School of Science and Mathematics appears within the UNC System classification it is excluded because it is a high school.

UNC System (15 total): East Carolina University, Elizabeth City State University, Fayetteville State University, North Carolina A&T State University, North Carolina Central University, North Carolina State University, UNC Asheville, UNC-Chapel Hill, UNC Charlotte, UNC Greensboro, UNC Pembroke, UNC School of the Arts, UNC Wilmington, Western Carolina University, and Winston-Salem State University

Appendix 3: **IPEDS datasets**

Additional datasets only consisting of institution names were formed by navigating to the IPEDS website, locating the "Use the Data" dropdown and selecting "Custom Data Files". Institutions were then selected by variable. Appalachian State itself was excluded from comparison groups despite fitting the criteria. All IPEDS data was selected by gathering institutions into separate groups by the following criteria, and then filtering to include only `control` == "Public" and `predominant_degree` == "Bachelor's" (based on the Georgetown dataset):

1. All institutions with "Carnegie Classification: Basic (beginning 2021-22)" = Category 18 (Master's Colleges & Universities: Larger Programs). This is how Appalachian State is listed.
2. All institutions with "Total price for in-state students living on campus" between $19825 and $26823 AND "Total price for out-of-state living on campus" between $34272 and $46368 in 2023-24. These values were chosen to be within 15% of Appalachian State's own values: $23324 and $40320 respectively.
3. All institutions with "Percent of full-time first-time undergraduates awarded any financial aid" between 63 and 77 AND "Average amount of federal, state, local or institutional grant aid awarded" between $6142 and $9212 in 2022-23. These were selected to be no more than 7% away from Appalachian State's percentage (70%) and 20% away from App State's average grant of $7677, respectively.
4. All institutions with "Full-time retention rate" of 85[%] in Fall 2023. This exactly matches Appalachian State's own reading.
5. All institutions with "Graduation rate, total cohort" reported on August 31, 2023 as between 72 and 74. This is designed to be within 1% of Appalachian State (73%).
6. All institutions with "ACT Composite 75th percentile score" equal to 27 in 2023-24. This exactly matches Appalachian State's own reading.
7. All institutions with "Undergraduate enrollment" from Fall 2023 between 17465 and 21346. This fits the range within 10% of Appalachian State's 19405.
8. All institutions with "Percent admitted - total" in 2023-24 equal to 89. This is equal to Appalachian State University's own value.

Institutions in Group 1 (141 total): Adams State University, Alabama A & M University, Angelo State University, Arkansas Tech University, Auburn University at Montgomery, Austin Peay State University, Bowie State University, Bridgewater State University, CUNY Bernard M Baruch College, CUNY Brooklyn College, CUNY Hunter College, CUNY John Jay College of Criminal Justice, CUNY Lehman College, CUNY Queens College, California Polytechnic State University-San Luis Obispo, California State Polytechnic University-Humboldt, California State Polytechnic University-Pomona, California State University-Bakersfield, California State University-Chico, California State University-Dominguez Hills, California State University-Los Angeles, California State University-Monterey Bay, California State University-Northridge, California State University-Sacramento, California State University-San Marcos, California State University-Stanislaus, Central Connecticut State University, Central Washington University, Chicago State University, Citadel Military College of South Carolina, Coastal Carolina University, College of Staten Island CUNY, Colorado State University Global, Columbus State University, Delta State University, East Central University, East Stroudsburg University of

Pennsylvania, Eastern Illinois University, Eastern New Mexico University-Main Campus, Eastern Washington University, Empire State University, Emporia State University, Fitchburg State University, Fort Hays State University, Framingham State University, Frostburg State University, Georgia College & State University, Governors State University, Grambling State University, Jacksonville State University, Kutztown University of Pennsylvania, Louisiana State University-Shreveport, McNeese State University, Metropolitan State University of Denver, Midwestern State University, Millersville University of Pennsylvania, Minnesota State University Moorhead, Minnesota State University-Mankato, Morehead State University, Murray State University, New Jersey City University, New Mexico Highlands University, North Carolina Central University, Northeastern Illinois University, Northeastern State University, Northwest Missouri State University, Northwestern State University of Louisiana, Pennsylvania Western University, Pittsburg State University, Plymouth State University, Purdue University Northwest, Ramapo College of New Jersey, Rhode Island College, SUNY Brockport, SUNY Buffalo State University, SUNY Polytechnic Institute,Saginaw Valley State University, Saint Cloud State University, Salem State University, Salisbury University, San Jose State University, Shippensburg University of Pennsylvania, Slippery Rock University of Pennsylvania, Sonoma State University, Southeast Missouri State University, Southeastern Louisiana University, Southeastern Oklahoma State University, Southern Arkansas University Main Campus, Southern Connecticut State University, Southern Oregon University, Southern Utah University, Southwest Minnesota State University, Southwestern Oklahoma State University, State University of New York at New Paltz, State University of New York at Oswego, Stephen F Austin State University, Sul Ross State University, Texas A & M International University, The College of New Jersey, The University of Texas Permian Basin, Towson University, Troy University, University of Alaska Anchorage, University of Arkansas Grantham, University of Baltimore, University of Central Missouri, University of Central Oklahoma, University of Houston-Downtown, University of Houston-Victoria, University of Illinois Springfield, University of Maryland Global Campus, University of Michigan-Dearborn, University of Minnesota-Duluth, University of Nebraska at Kearney, University of North Alabama, University of North Carolina at Pembroke, University of North Georgia, University of North Texas at Dallas, University of Northern Iowa, University of Southern Indiana, University of Southern Maine, University of Washington-Bothell Campus, University of Washington-Tacoma Campus, University of West Alabama, University of Wisconsin-La Crosse, University of Wisconsin-Platteville, University of Wisconsin-Stout, University of Wisconsin-Whitewater, Utah Valley University, Wayne State College, Weber State University, West Texas A & M University, Western Illinois University, Western New Mexico University, Western Oregon University, Western Washington University, Westfield State University, William Paterson University of New Jersey, Winthrop University, Worcester State University, Youngstown State University

Institutions in Group 2 (103 total): Adams State University, Angelo State University, Augusta University, Ball State University, Bowie State University, California State Polytechnic University-Humboldt, California State University-Channel Islands, California State University-Fresno, California State University-Northridge, California State University-San Bernardino, California State University-San Marcos, California State University-Stanislaus, Colorado Mesa University, Columbus State University, Commonwealth University of Pennsylvania, Concord University, East Carolina University, Eastern Kentucky University, Farmingdale State College, Florida Agricultural and Mechanical University, Florida Atlantic

University, Florida Gulf Coast University, Florida International University, Florida State University, Francis Marion University, Georgia Southern University, Grambling State University, Idaho State University, Indiana State University, Indiana University-South Bend, Indiana University-Southeast, Iowa State University, Jacksonville State University, Kennesaw State University, Lamar University, Lewis-Clark State College, Louisiana State University-Shreveport, Marshall University, Montana State University Billings, Montana Technological University, Morgan State University, New Mexico Institute of Mining and Technology, New Mexico State University-Main Campus, North Carolina A & T State University, North Carolina Central University, Northern Kentucky University, Northwestern State University of Louisiana, Pittsburg State University, Purdue University Fort Wayne, Purdue University-Main Campus, Saginaw Valley State University, Sam Houston State University, Southeastern Louisiana University, Stephen F Austin State University, Sul Ross State University, SUNY at Fredonia, SUNY College at Potsdam, Tennessee State University, Texas A & M University-Commerce, Texas A & M University-Kingsville, Texas A&M University-Texarkana, Texas Woman's University, The University of Montana-Western, The University of Tennessee-Chattanooga, The University of Texas at El Paso, The University of Texas at San Antonio, The University of Texas at Tyler, The University of Texas Rio Grande Valley, University of Alaska Fairbanks, University of Arkansas at Little Rock, University of Central Florida, University of Florida, University of Hawaii at Hilo, University of Houston, University of Houston-Clear Lake, University of Idaho, University of Louisiana at Monroe, University of Maine at Augusta, University of Maine at Farmington, University of Maryland Eastern Shore, University of Nebraska at Omaha, University of Nevada-Las Vegas, University of New Mexico-Main Campus, University of North Alabama, University of North Carolina at Charlotte, University of North Carolina at Greensboro, University of North Florida, University of North Texas at Dallas, University of South Alabama, University of South Carolina Aiken, University of South Carolina Beaufort, University of South Florida, University of Southern Indiana, University of Southern Maine, University of West Georgia, University of Wisconsin-Milwaukee, University of Wyoming, Utah State University, Utah Tech University, Washburn University, West Virginia University Institute of Technology, Western Colorado University, Western Oregon University

Institutions in Group 3 (10 total): Bowie State University, Christopher Newport University, Farmingdale State College, Pennsylvania State University-Penn State Harrisburg, Pennsylvania State University-World Campus, University of Arkansas, University of Hawaii-West Oahu, UNC Charlotte, UNC Wilmington, Virginia Polytechnic Institute and State University

Institutions in Group 4 (12 total): Arizona State University Campus Immersion, California State University-Fullerton, California State University-Long Beach, Colorado State University-Fort Collins, SUNY College of Environmental Science and Forestry, Texas Tech University, University of Kansas, UNC Charlotte, UNC Wilmington, University of Northern Iowa, University of Oregon, University of Utah

Institutions in Group 5 (13 total): Citadel Military College of South Carolina, CUNY Bernard M Baruch College, Florida International University, New Jersey Institute of Technology, Ramapo College of New Jersey, Stockton University, SUNY College at Geneseo, The University of Alabama, The University of Tennessee-Knoxville, University at Buffalo, University of California-Santa Cruz, University of Cincinnati-Main Campus, University of Iowa

Institutions in Group 6 (37 total): Bridgewater State University, Central Michigan University, Farmingdale State College, Illinois State University, Indiana University-Northwest, Kansas State University, Louisiana Tech University, Montana State University, New College of Florida, Oklahoma State University-Main Campus, Old Dominion University, Pennsylvania State University-Penn State Abington, Pennsylvania State University-Penn State Altoona, Pennsylvania State University-Penn State New Kensington, Southern Illinois University-Carbondale, State University of New York at Oswego, Stockton University, SUNY Polytechnic Institute, Tennessee Technological University, University of Colorado Denver/Anschutz Medical Campus, University of Hawaii at Manoa, University of Kansas, University of Louisiana at Lafayette, University of Louisville, University of Massachusetts-Dartmouth, University of Minnesota-Rochester, University of Missouri-St Louis, UNC Charlotte, UNC Greensboro, UNC School of the Arts, University of North Texas, University of Southern Mississippi, University of Wisconsin-Eau Claire, University of Wisconsin-La Crosse, University of Wisconsin-Platteville, Western Connecticut State University, Western Michigan University

Institutions in Group 7 (31 total): East Carolina University, Georgia Institute of Technology-Main Campus, Grand Valley State University, Illinois State University, James Madison University, Kent State University at Kent, Middle Tennessee State University, Mississippi State University, Missouri State University-Springfield, Montclair State University, Ohio University-Main Campus, Old Dominion University, Sam Houston State University, San Francisco State University, Stony Brook University, The University of Texas at Dallas, The University of Texas at El Paso, University at Buffalo, University of California-Santa Cruz, University of Connecticut, University of Delaware, University of Kansas, University of Mississippi, University of Nebraska-Lincoln, University of Nebraska-Reno, UNC-Chapel Hill, University of Oregon, University of Virginia-Main Campus, University of Wisconsin-Milwaukee, Virginia Commonwealth University, West Virginia University

Institutions in Group 8 (14 total): Augusta University, Bridgewater State University, Frostburg State University, George Mason University, Illinois State University, Iowa State University, Keene State College, Millersville University of Pennsylvania, New Jersey City University, Salisbury University, Texas A & M University-Corpus Christi, Texas State University, University of Louisiana at Lafayette, Virginia State University