4-28-2022

Maine Trail Visitor Count 2019 to 2021

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FINAL REPORT

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Prepared for Maine Office of Outdoor Recreation
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Maine Bureau of Parks and Lands

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DECEMBER 2021

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Executive Summary

Trail usage data are critical to informing decisions about investments in new trails and infrastructure, the maintenance of existing trails and infrastructure, and management of trails. Maine, like many other states, lacks detailed and consistent data on trail use, and this lack of information complicates decision-making, investments, and planning. New data and technologies create opportunities for Maine to improve knowledge of trail use, increase outdoor recreation experiences associated with these trails and strengthen the economic and community impacts of these trails. In collaboration with Maine's Office of Outdoor Recreation, the Maine Bureau of Parks and Lands, and the Maine Trails Coalition, we completed this project to assess the potential for using new data resources made available by StreetLight to document trail usage in Maine. We focused our work around three objectives: (1) establishing baseline estimates of trail use at 181 designated locations for 2019; (2) assessing changes in trail use at these 181 locations during the first and second year of COVID (2020-2021) compared to this 2019 baseline; and (3) exploring the use of StreetLight Pedestrian and Cycling Index data to identify trail use broadly in Maine.

Trail use in 2019 varied by location and activity mode. We tracked pedestrian and bicycle use at 89 trail sites. Trail use varied widely across these locations. Average pedestrian trail usage is higher in larger population centers, as well as at popular coastal recreational destinations such as Rockland Breakwater and Acadia National Park. Portland's waterfront Eastern Promenade Trail and Back Cove Trail had the highest daily average pedestrian and cycling use in 2019 as measured by the StreetLight index. Likewise, average bicycling usage of trails was higher in urban areas, such as Augusta, Bangor, Belfast, Brunswick, Farmington, Portland, and Waterville. By also tracking pedestrian and bicycling use at 92 trail locations within Camden Hills and Mount Blue State Parks, we detected strong variation in trail use within parks base on popular features such as peaks and lookouts.

Trail use increased during 2020 and 2021.

Pedestrian activity on trails in our sample increased 112% during the first two years of the pandemic. For the 89 trail sites monitored across Maine, the pedestrian index increased from 4,807 in 2019 to 8,644 in 2021. The year over year increase from 2019 to 2020 was 64% (4,807 to 7,014), and 15% from 2020 to 2021 (7,014 to 8,644).

Portland saw the largest increase in pedestrian activity from 2019 to 2021. Portland's waterfront Eastern Promenade Trail and Back Cove Trail have the highest daily average pedestrian use as measured by the StreetLight pedestrian index.

Hiker usage of trails within some parks or trail systems varied in 2019, 2020, and 2021. At Camden Hills State Park, we found year over year increases in pedestrian use of all trail segments from 2019 to 2020. In 2021, the index for trails at the north trailheads in Camden Hill State Park decreases, indicating that the increased trail use in these interior locations was temporary. However, the park's most popular trails sections - Mt Megunticook, Maiden Cliff, Mt Battie – continue to be used extensively, with even larger increases of pedestrian traffic in 2021 relative to 2019 than in 2020.

Cycling activity increased in 2020 and returned to the 2019 baseline in 2021. The cycling index across the 89 monitored sites increased by 18% in 2020 compared to 2019, and then returned to the 2019 baseline in 2021. Changes in trail use by bicyclists varied across tourism regions. The Kennebec and Moose River Valley, Maine Beaches and the Mid-Coast regions followed this general trend of increased cycling activity and then a return to the 2019 baseline. In contrast, bicycling activity in the Downeast & Acadia region has continued to increase in 2021 relative to 2020. Cycling in the Portland area trail locations that we monitored decreased in both 2020 and 2021 relative to 2019.

Lessons Learned about StreetLight and Monitoring Use of Trails in Maine

StreetLight metrics have great potential to guide future recreation monitoring and management in Maine. Our work to date suggests the StreetLight data in their current form can pick up broad trends in overall use, relative use across sites within a given year, and year to year changes in use. While we are encouraged by its potential, we recognize that the current bicycle and pedestrian indexes do not fully meet the needs of recreation and trail managers, bicycle and pedestrian infrastructure planners, and other outdoor recreation stakeholders that would be better served by volume data.

Using StreetLight metrics in combination with traditional counts of trail usage for validation will strengthen future applications. Consistent with other studies, we believe StreetLight metrics are best used in combination with physical trail use counts at this time given the data's current limitations.

Coordinated physical trail counting and StreetLight assessments will accelerate knowledge generation about trail use and advances in the use of StreetLight metrics to inform outdoor recreation planning and management. The primary benefits of StreetLight and other novel data sources to outdoor recreation planners include the ability to track trip activity and user characteristics without physical counters and user surveys. Given the need for data on trail usage and validation of StreetLight and other potential novel data sources in Maine, we encourage greater coordination and planning of physical counter usage on Maine trails.

Continuing to engage with StreetLight will improve calibration of these bicycle and pedestrian indexes to Maine. We have reported our experiences using StreetLight bicycle and pedestrian indexes in Maine to StreetLight, and continued engagement with StreetLight staff about the use of their metrics and the needs of the active transportation planning and outdoor recreation communities will continue to improve Maine data and algorithms.

Using StreetLight vehicle data may be a strategic option for assessing use at some recreation sites. In situations where general use of a recreation site is of interest, StreetLight vehicle data at parking lots and trailheads may provide better overall visitation information than the bicycle and pedestrian indices.

Improved Maine trail data resources will benefit outdoor recreation planning and management. Accessible information and data about Maine trails will help future research and planning efforts, regardless of whether StreetLight data are used. Online and publicly available information about trail locations, trail attributes, and trail counts could help structure future assessments of trail use, trail users, and their economic contributions and impacts.

Introduction

As Maine's outdoor recreation economy and trail networks continue to grow, better trail usage information continues to grow in importance. Trail use information tells us where, when, and how users engage with trails. Accordingly, trail usage data are critical to informing decisions about investments in new trails and infrastructure, the maintenance of existing trails and infrastructure, and management of trails. More broadly, documentation of trail use informs several other types of decisions, including business and community planning, public safety planning, land management and conservation, quality of life investments, local public health initiatives, and active transportation planning. At present, Maine, like many other states, lacks detailed and consistent data on trail use, and this lack of information complicates decision-making, investments, and planning. Fortunately, the need for and significance of improved trail usage data are well understood in Maine, including by Maine's Office of Outdoor Recreation, Bureau of Parks and Lands, and The Maine Trails Coalition.

This summary report of our work, done in collaboration with Maine's Office of Outdoor Recreation, Bureau of Parks and Lands, and The Maine Trails Coalition, builds on the

recognition that new data and technologies create opportunities for Maine to improve its provision of outdoor recreation and create jobs and economic opportunity through more targeted investments in access and information on trails and surrounding communities. In particular, we

(1) Establish baseline estimates of trail use at designated Maine locations using StreetLight Data for 2019;

(2) Assess changes in trail use at selected locations during the first and second year of COVID (2020-2021) compared to a pre COVID year (2019); and

(3) Explore the use of StreetLight Pedestrian and Cycling Index Data to identify trail usage.

By doing this work, we advanced understanding of new approaches for user monitoring and new sources of data to document trail use in Maine. We also helped improve knowledge of the use of recreational and multi-purpose trails in Maine. Further, we contributed to an expanding line of research focused on applications of novel data to address critical knowledge gaps related to the use of recreation areas and active transportation facilities and the impacts of this usage on communities, regions, and economies (see Lawson, M. 2021 for a recent review).

Methodology

We estimated bicycle and pedestrian usage for 181 locations representing a range of uses across the southern third of Maine. We used StreetLight Insight Index metrics to estimate the relative use and conducted post-processing and visualization of these data using R software to summarize baseline trail use and assess changes in trail use. This project makes use of Maine DOT's subscription to StreetLight InSight. This data portal provides transportation metrics within a subscription zone that spans from Kittery to Bangor to Bar Harbor. To establish a baseline of trail usage and subsequent changes in usage, we queried StreetLight's pedestrian and bicycle index metrics for 181 trail locations across the

subscription zone. We were then able to compare either the pedestrian or the cycling index metrics across trails locations and years, to observe how trail use has changed during the pandemic compared to the 2019 baseline. With limited use of physical trail counters in Maine, this new data set will be helpful to those interested in the management and development of outdoor recreation and active transportation facilities.

What are StreetLight InSight Metrics?

StreetLight InSight provides online data and visualization tools, where users can select analysis parameters such as locations and time periods and receive estimates of trips activity by mode: auto, transit, trucks, bike, and pedestrians. These metrics are generated using machine learning and a large sample of location-based service (LBS) and GPS data for North America - estimated to represent around 10% of all travelers. Vehicle traffic volume metrics are then calibrated using permanent traffic counters across the country. The pedestrian and bike metrics have not yet been calibrated to represent the actual volume, and so the metric is an index value. StreetLight has published numerous blogs, case studies and white papers on the use and validation of their metrics at www.streetlightdata.com.

What are the Pedestrian and Bicycle Index metrics?

The Pedestrian and Bicycle Index metrics are not measures of actual trips, rather are values that are proportional to a baseline value, allowing users to compare relative trip activity across locations and time periods. The indices are specific to each mode, so a pedestrian index of 5 is not the same as a bike index of 5. For example, if the index in location A is 5, B is 10 and C is 50, then trips in location B are twice the volume as A, and cycling activity at C is 10 times more than A, or 5 times more than B. If the index at location A is 5 in 2019, 20 in 2020 and 10 in 2021, then we can say that there was a 400% increase in 2020 compared to 2019, and a 50% decrease from 2020 to 2021. We can also note that from 2019 to 2021, trip activity doubled at location A.

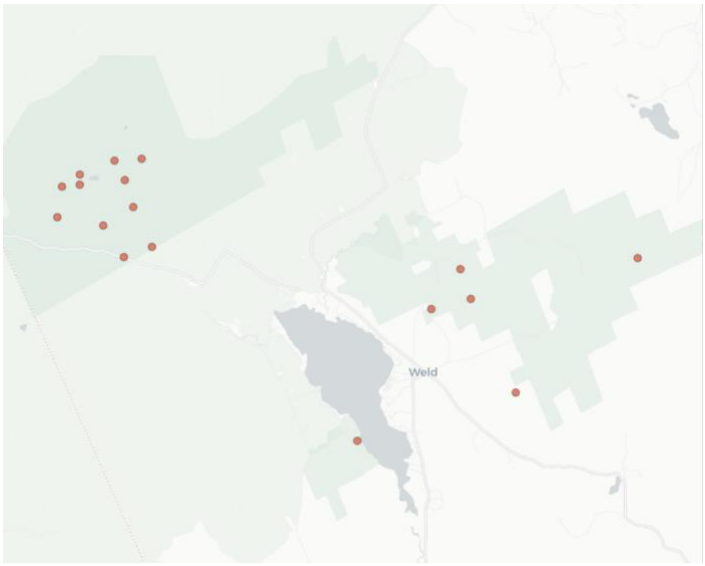
Trail and Count Site Selection

With assistance from The Maine Office of Outdoor Recreation, Maine Bureau of Parks and Lands, and The Maine Trails Coalition we selected 181 trails representing a range of uses across the southern third of Maine. Our selection criteria included sites where trail use is anecdotally increasing and or is being considered for repairs or upgrades due to increased use during the pandemic. Multi-use paths with longer distances as well as shorter paths in communities and more remote hiking and mountain biking trails are included, such as:

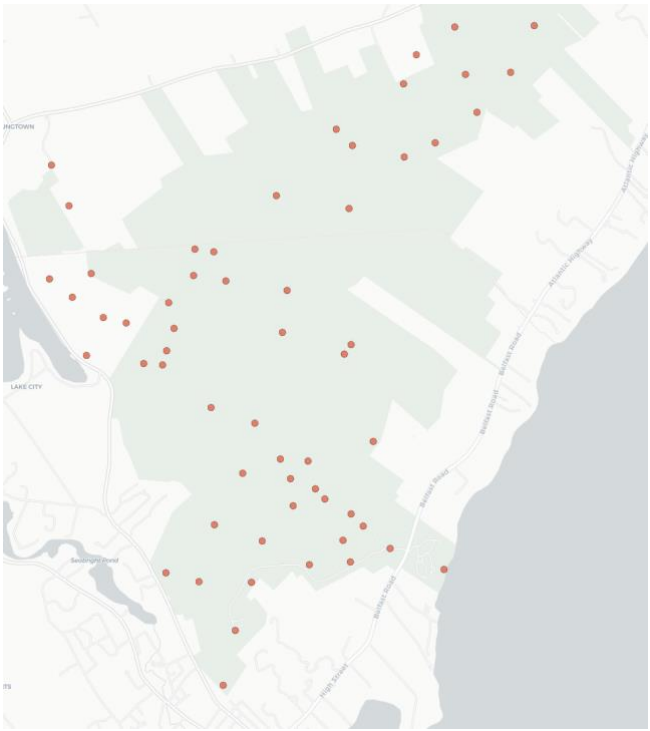
- Eastern Trail - Kennebunk to Biddeford, Saco to Scarborough
- Mountain Division Trail - Windham to Standish, Fryeburg
- Downeast Sunrise Trail - Ellsworth to Cherryfield
- Kennebec River Rail Trail - Augusta to Gardiner
- Whistle Stop Rail Trail - Jay to Farmington

Camden Hills State Park and Mount Blue State Park were added to the study to explore the possibility of using StreetLight metrics for an in-depth analysis of individual trail segment use. We wanted to know if StreetLight's metrics are available at the scale of a trail in both urban and rural areas.

Mount Blue State Park



Camden Hills State Park

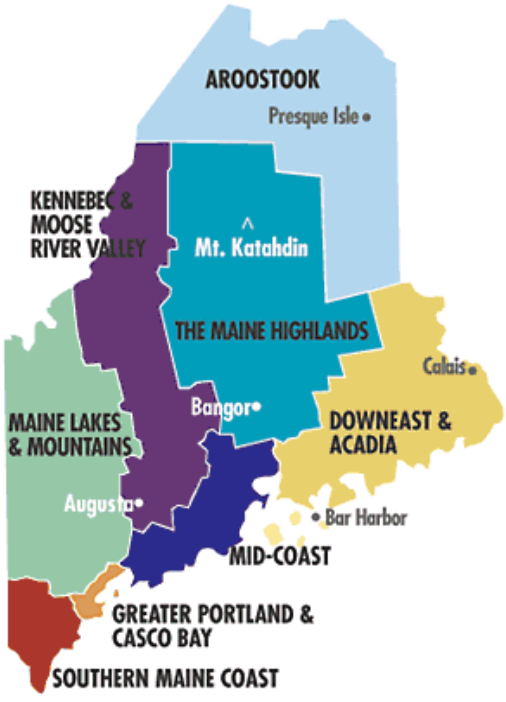


StreetLight Analysis Parameters

We input trail locations into StreetLight, and then ran individual analyses for each year and mode for all locations. We selected the 'Zone Analysis' type with each zone as a bi-directional pass-through zone, meaning that StreetLight will return the average daily number of trips passing through the zone in both directions. We selected the time period of January-September, so that we could include data from 2021. StreetLight recommends using a longer time period of several months when using zones with lower traffic, so that enough trips are recorded in the zone to ensure privacy.

For the first set of 89 count locations across the state, 91% of the sites have a pedestrian index and 86% of sites have a cycling index value. The locations with NA metrics are different across modes, for example, the Downeast Sunrise trail has cycling index metrics but not pedestrian, and locations with steep hiking trails return a null value for the cycling index and positive pedestrian indexes. We grouped these 89 sites using Maine's eight tourism regions to summarize trip activity trends. This is not a comprehensive assessment of trails throughout the region.

Tourism Region	Sites with Pedestrian Data	Sites with Cycling Data
Downeast and Acadia	7	11
Greater Portland and Casco Bay	22	21
Kennebec and Moose River Valley	12	11
Maine Lakes and Mountains	18	16
Mid-Coast	9	8
Southern Maine Coast	11	10
Sites with no data	10	12
Total	**89**	**89**



Baseline Trail Use in 2019

Analyzing the impact of the COVID-19 pandemic on outdoor recreation and trail use in Maine required establishing cycling and pedestrian baselines. We use StreetLight Index metrics from January- September 2019. The baseline is generated using the same parameters for all sites, but the results are reported in two parts: 89 trail locations across Maine's StreetLight subscription zone, and 92 locations at individual trail segments in Camden Hills and Mount Blue State Parks.

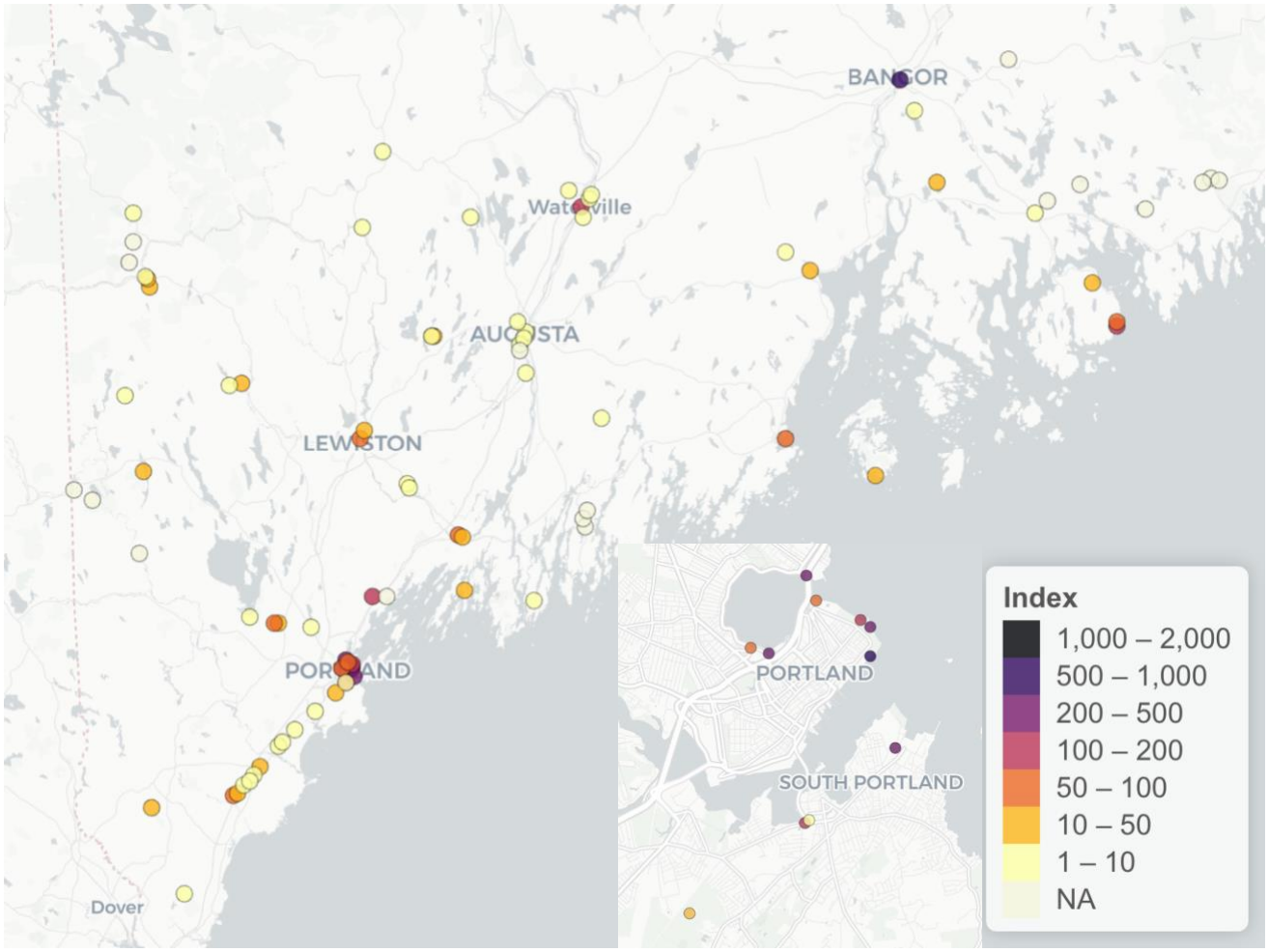
This section summarizes the 2019 baseline pedestrian and cycling index metrics using thematic maps for the 89 sites throughout Maine and the 92 sites within Camden Hills and Mount Blue State Parks. Cycling and Pedestrian index metrics for each site, from 2019-2021, are shown on individual maps in Appendix A and in tabular form in Appendix B.

2019 Pedestrian Baseline

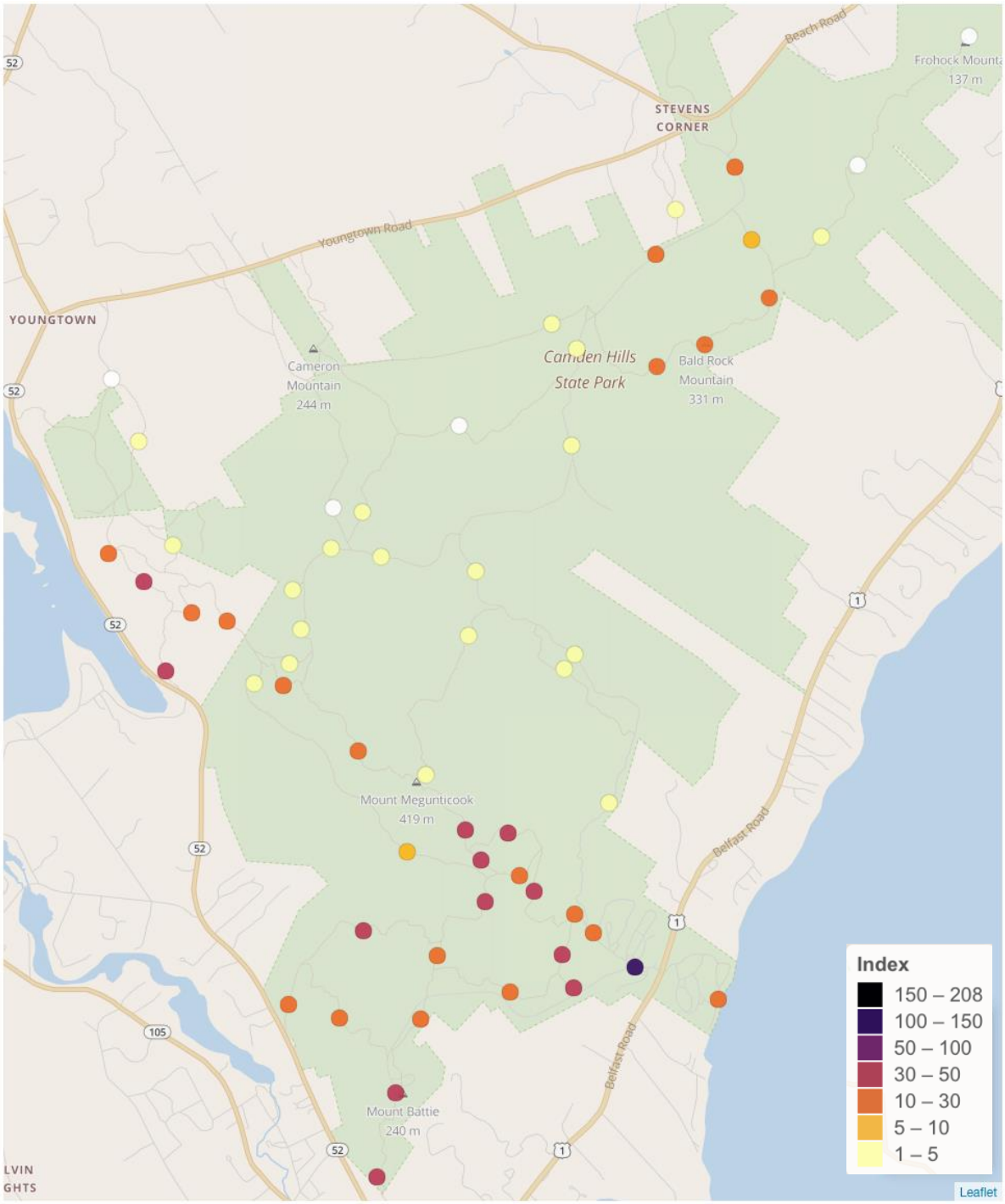
Average pedestrian trail usage is higher in larger population centers, as well as popular coastal recreational destinations such as Camden State Park, Rockland Breakwater, Acadia National Park. Inland trails have lower baselines, as well as more sites and year missing metrics altogether. Trails in the regions of Greater Portland & Casco Bay and Downeast & Acadia have the highest average daily traffic. Portland's waterfront Eastern Promenade Trail and Back Cove Trail have the highest daily average pedestrian use as measured by our index.

The pedestrian index is not directly comparable to the cycling index. It has a higher range – up to 1000 – than the cycling index which only reaches 250 for the same locations. In the future, it may be possible to calibrate the index value to trip counts if there are enough physical counts across the subscription zone. In which case, there could be a comparison of cycling and pedestrian trip volume.

Southern Maine Subscription Zone Baseline: 2019 Pedestrian Index

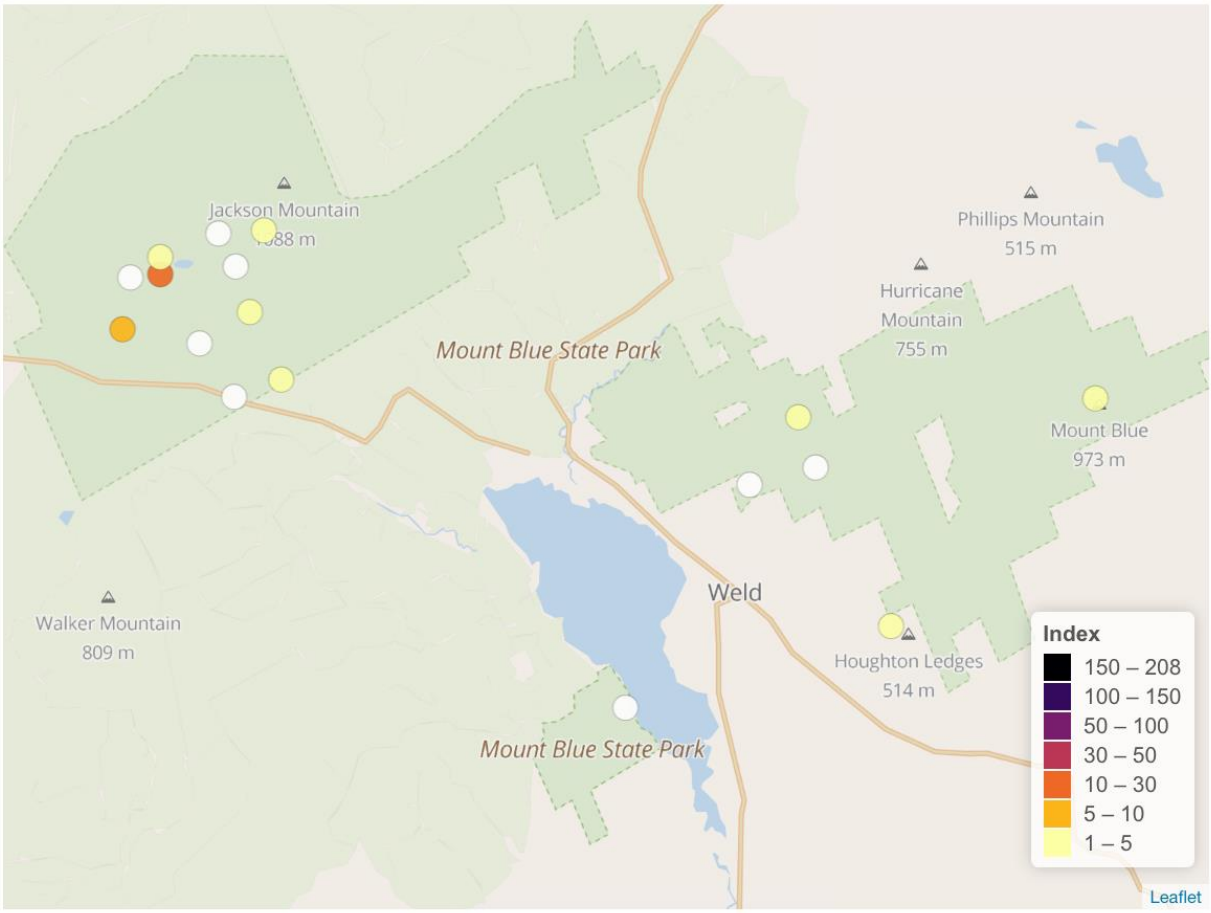


Camden Hills State Park Baseline: 2019 Pedestrian Index



Note the scale of the pedestrian index for individual trail segments in the State Parks are smaller than the 89 sites across Maine's subscription zone.

Mount Blue State Park Baseline: 2019 Pedestrian Index



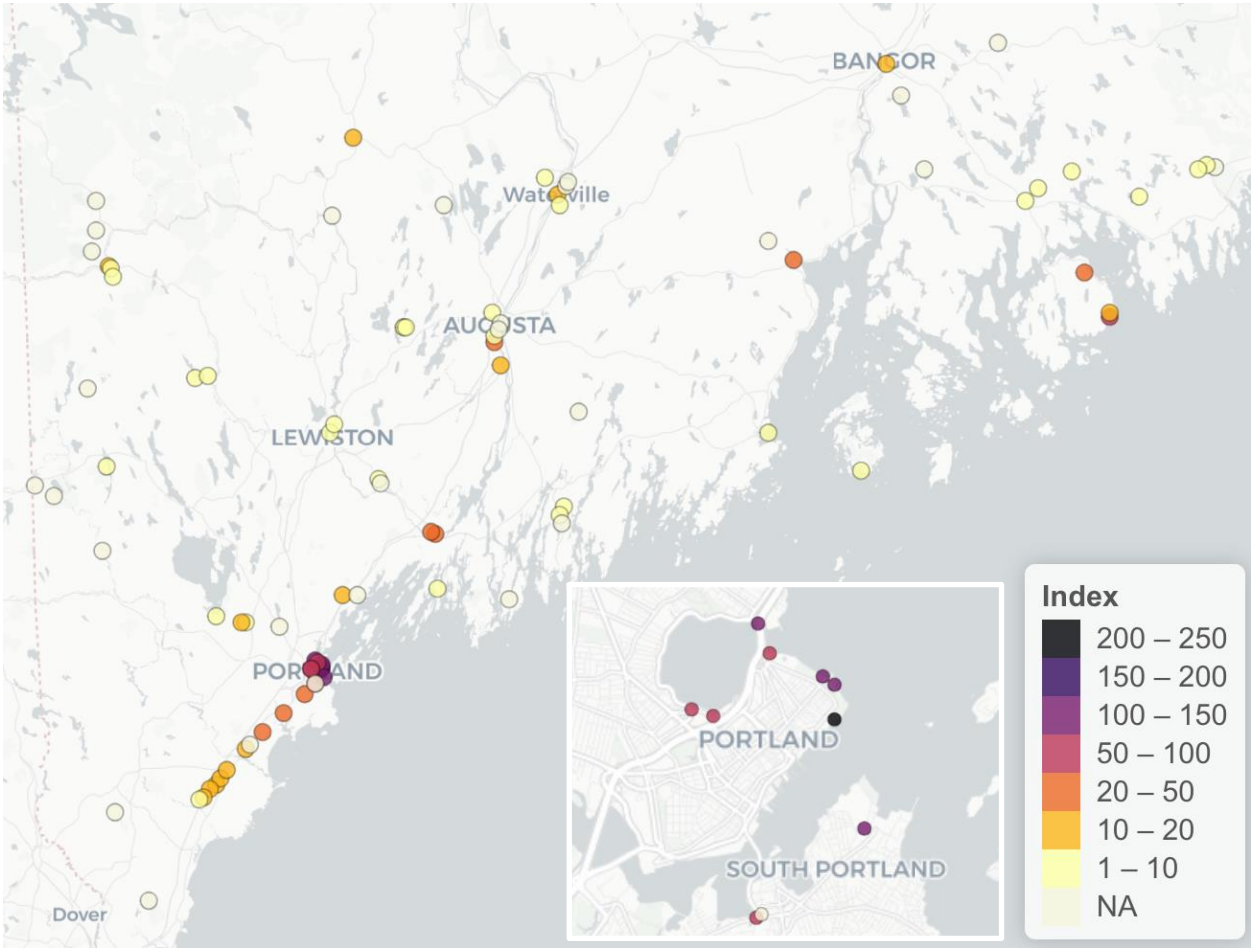
2019 Cycling Baseline

Cycling activity on the trails in this study is concentrated in the Portland area and parts of the Eastern Trail in York County. The most used cycling trails outside of Portland are in cities such as Augusta, Bangor, Belfast, Brunswick, Farmington, and Waterville. There was very little cycling activity in Camden Hills SP or Mount Blue SP, which are primarily hiking destinations. We did not include a cycling baseline for Mount Blue SP.

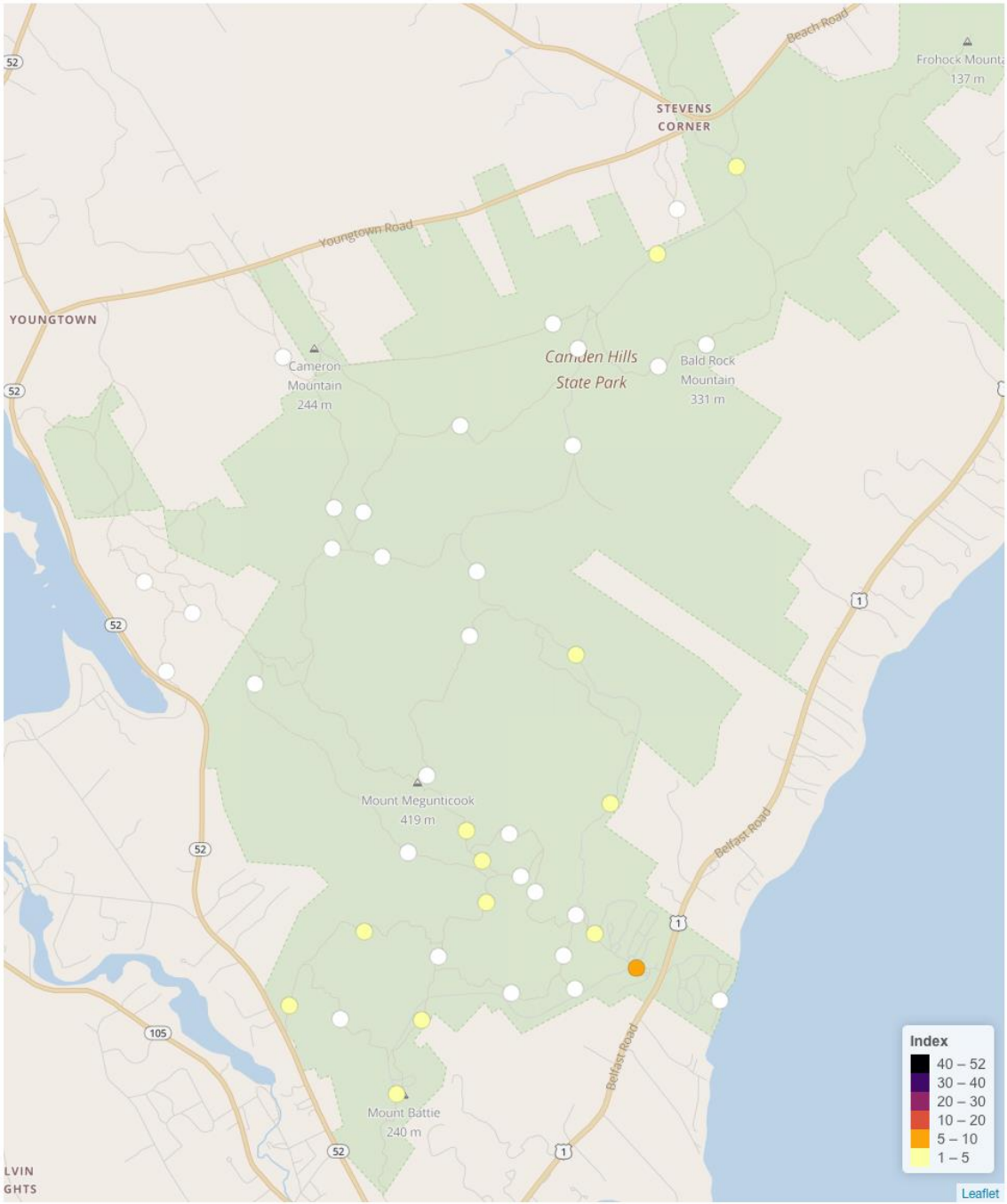
Note that the cycling index is not directly comparable to the pedestrian index. It is also in a much smaller range (1-250) than the pedestrian index (1-1000). In the future, it may be

possible to calibrate the index value to trip counts if there are enough physical counts across the subscription zone.

Southern Maine Subscription Zone Baseline: 2019 Cycling Index



Camden Hills State Park Baseline: 2019 Cycling Index

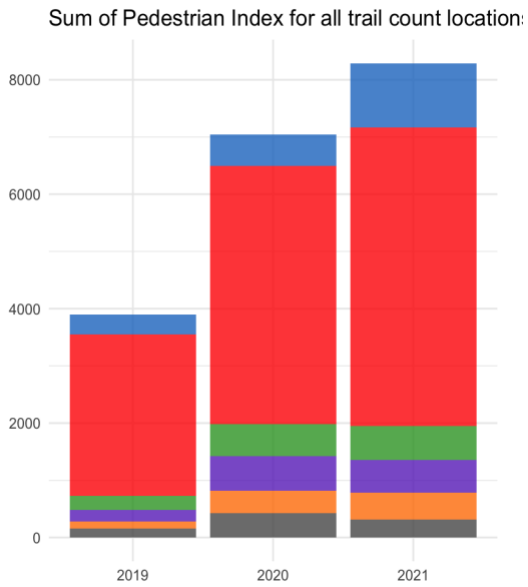


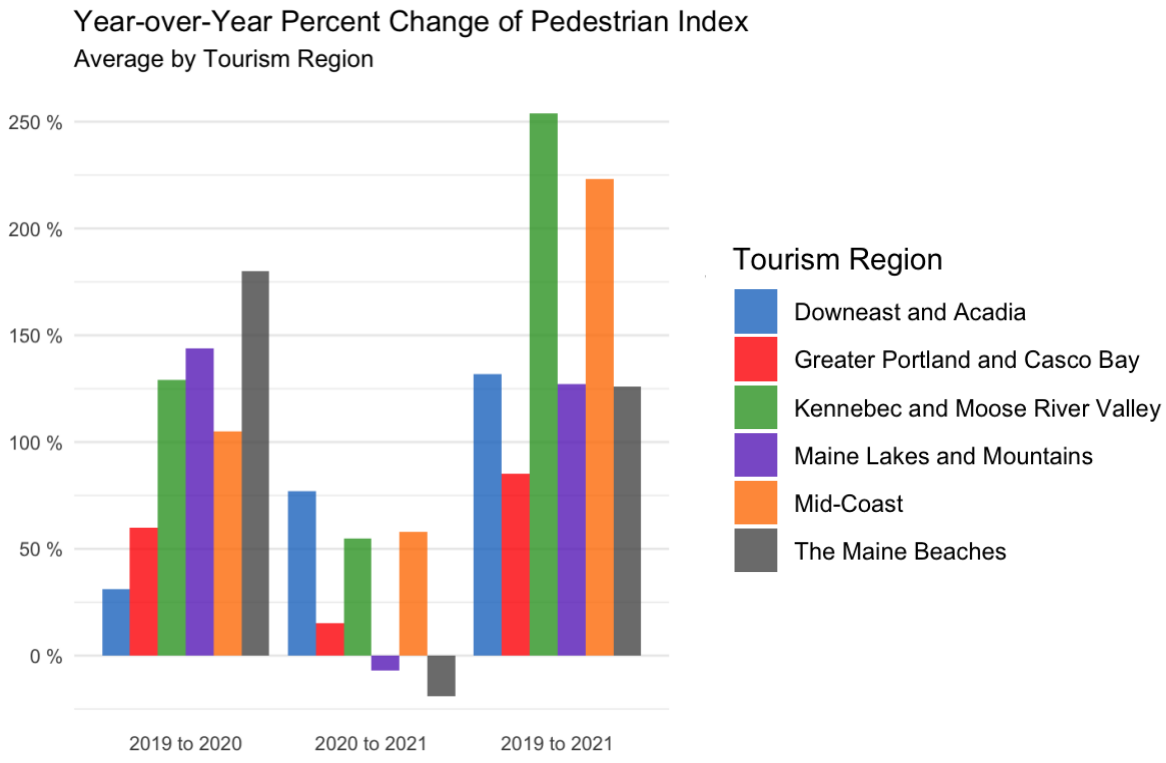
Note: White circles indicate metrics did not return a cycling index.

Key Findings of Trail Use during the Pandemic in 2020 and 2021

Pedestrian activity doubled during the first two years of the pandemic

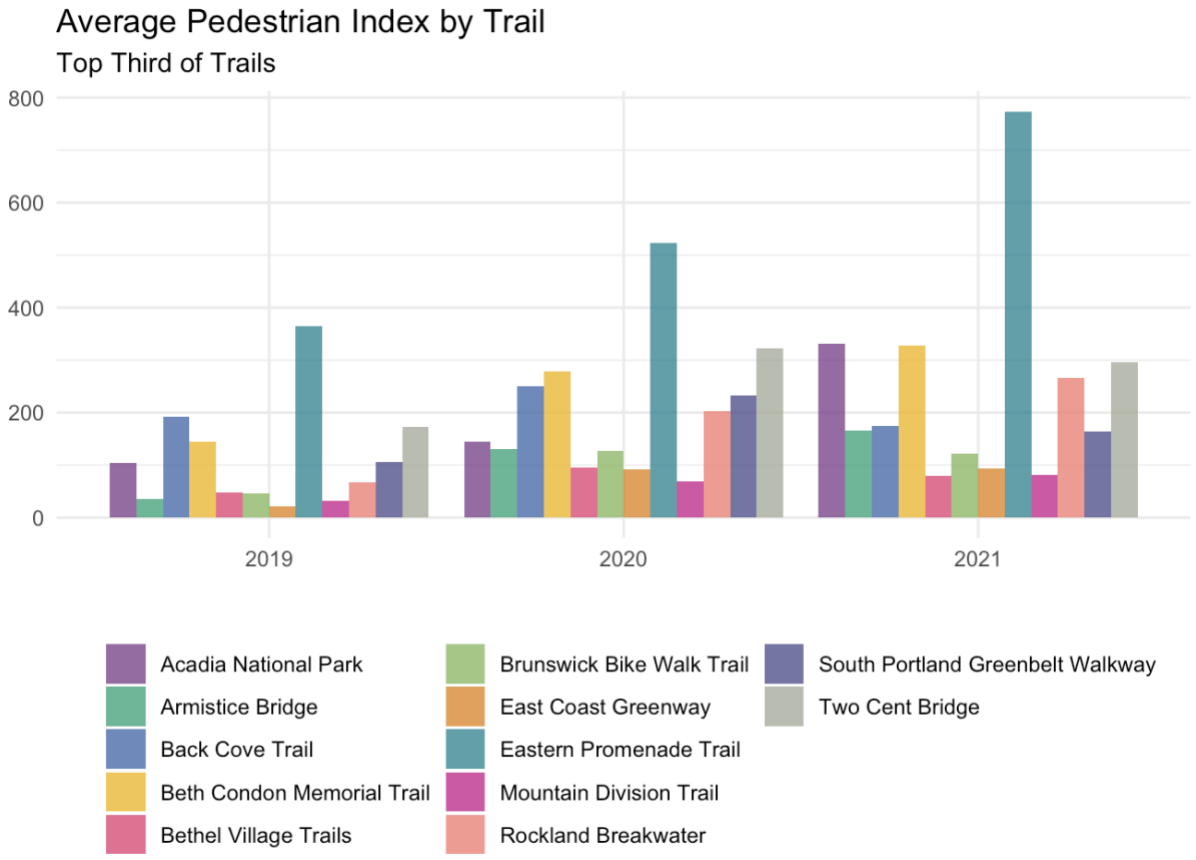
The average pedestrian index of the 89 trail sites monitored across Maine increased by 64% from 2019 to 2020, and a further 15% in 2021. The chart below shows that the growth in trail use has doubled in most regions, from 80% to over 200%, over the course of the first two years of the pandemic. Pedestrian activity in the Maine Beaches and the Maine Lakes and Mountains regions decrease slightly in 2021 compared to 2020. We grouped the 89 trail sites by tourism region to compare year over year percent changes. Trails with low baseline index metrics often have very large percent changes in 2020 and 2021 for relatively small absolute differences in index value.





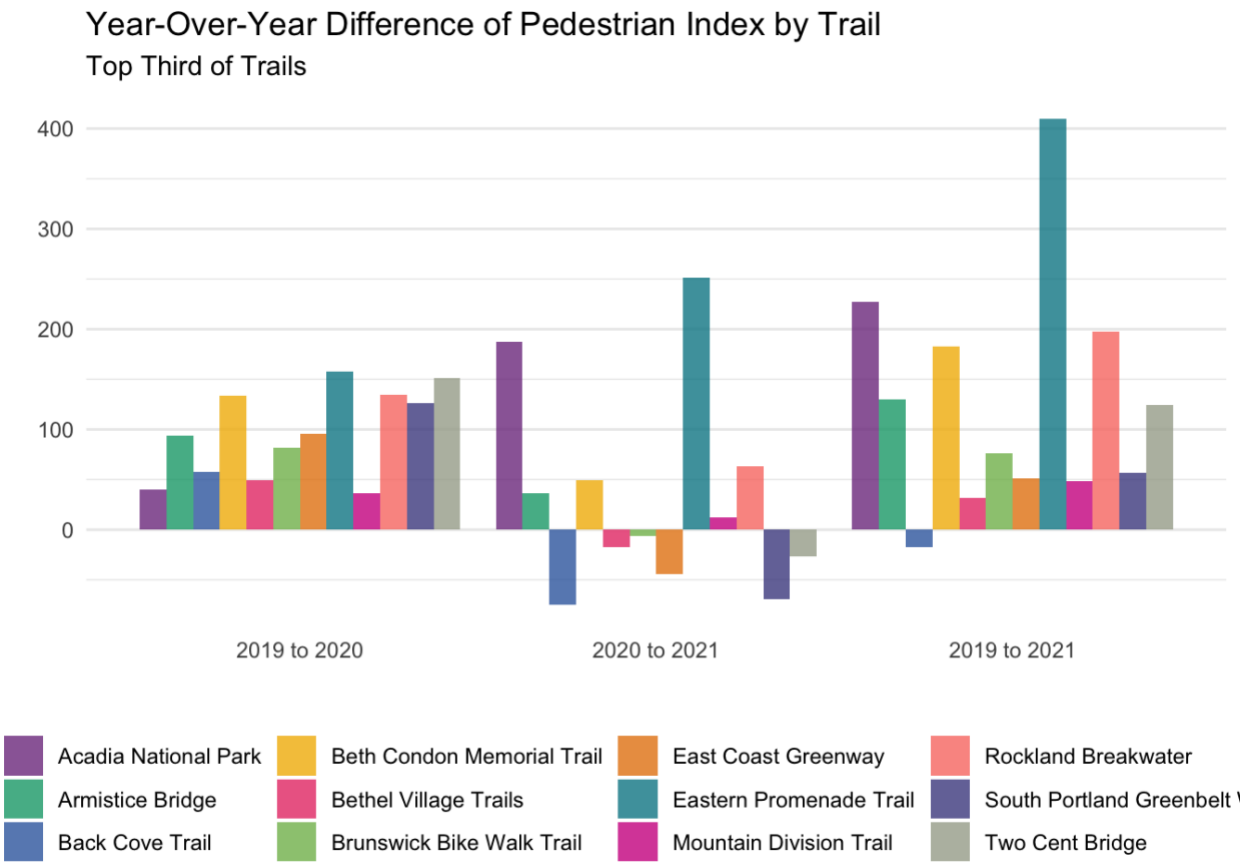
Portland saw the largest increase in pedestrian activity from 2019 to 2021

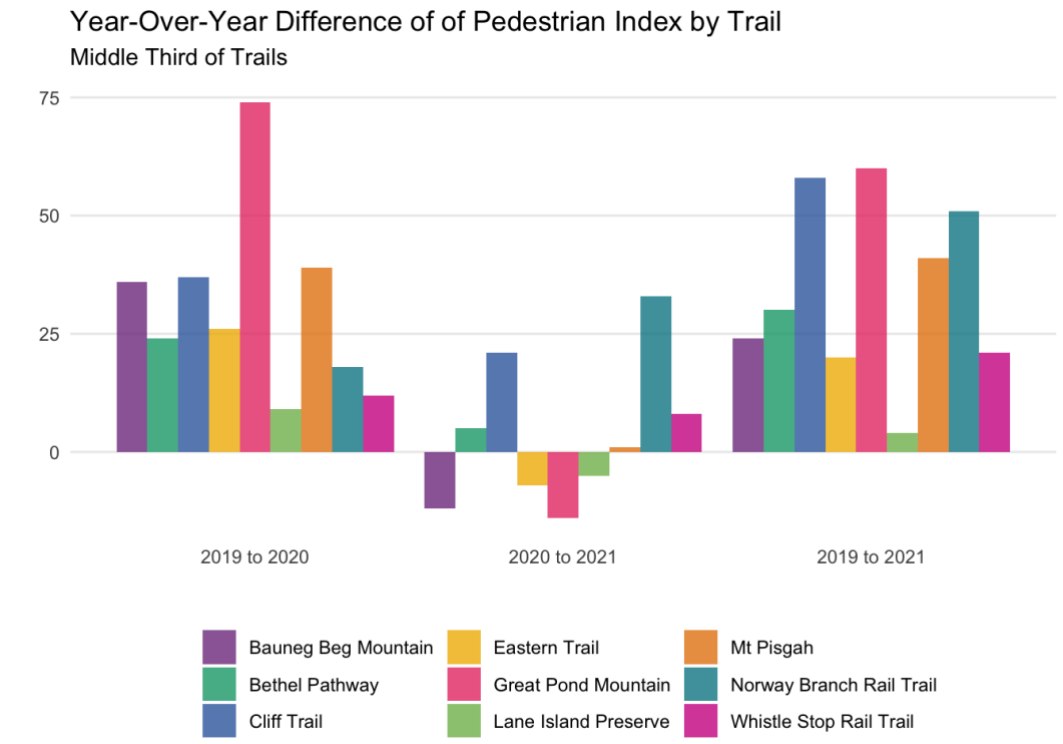
Trails in the regions of Greater Portland & Casco Bay and Downeast & Acadia have the highest average daily traffic. The Park Loop Road and Beehive Trails in Acadian National Park saw a large increase in activity in 2021, over 200% relative to the 2019 baseline. Portland's waterfront Eastern Promenade Trail and Back Cove Trail have the highest daily average pedestrian use as measured by our index.

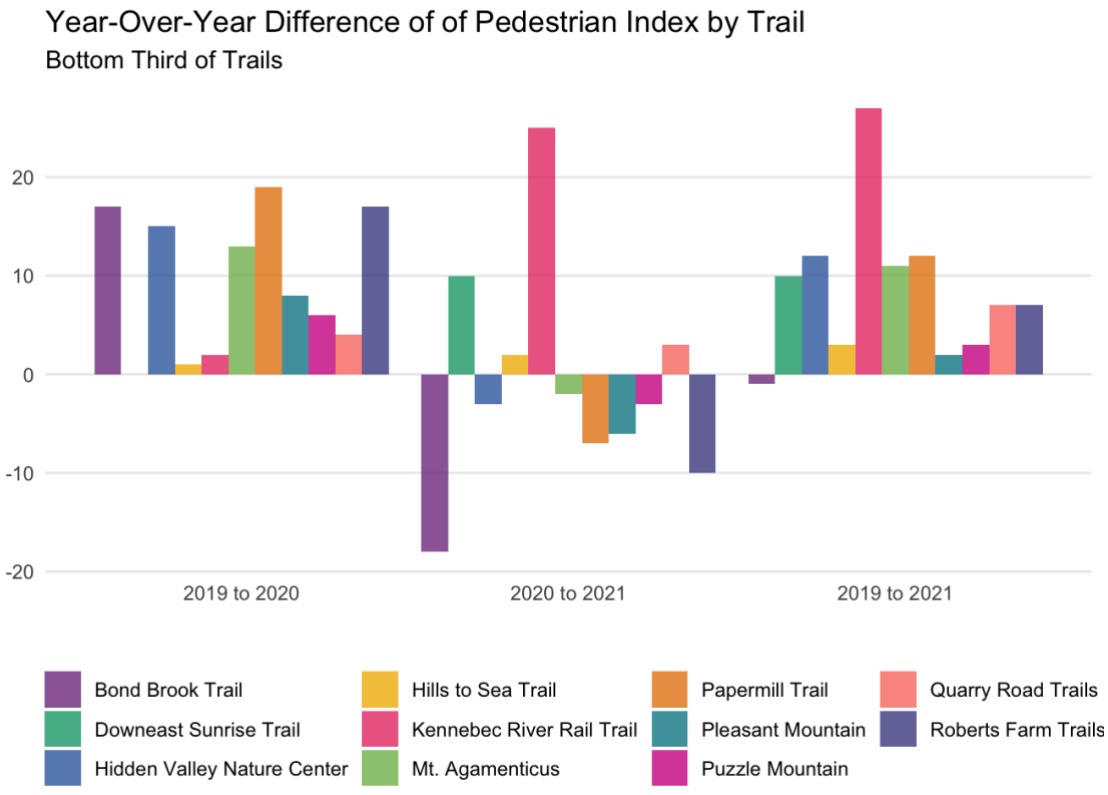


All trails monitored have increased pedestrian activity over the first two years of the pandemic. Some trails have year over year increases in both 2020 and 2021, whereas other trails levelled off or slightly reduced in pedestrian activity in 2021 relative to 2020.

The year over year difference is much higher for trails that had lower index metrics in 2019, such as the Armistice Bridge in Belfast and the Rockland Breakwater.

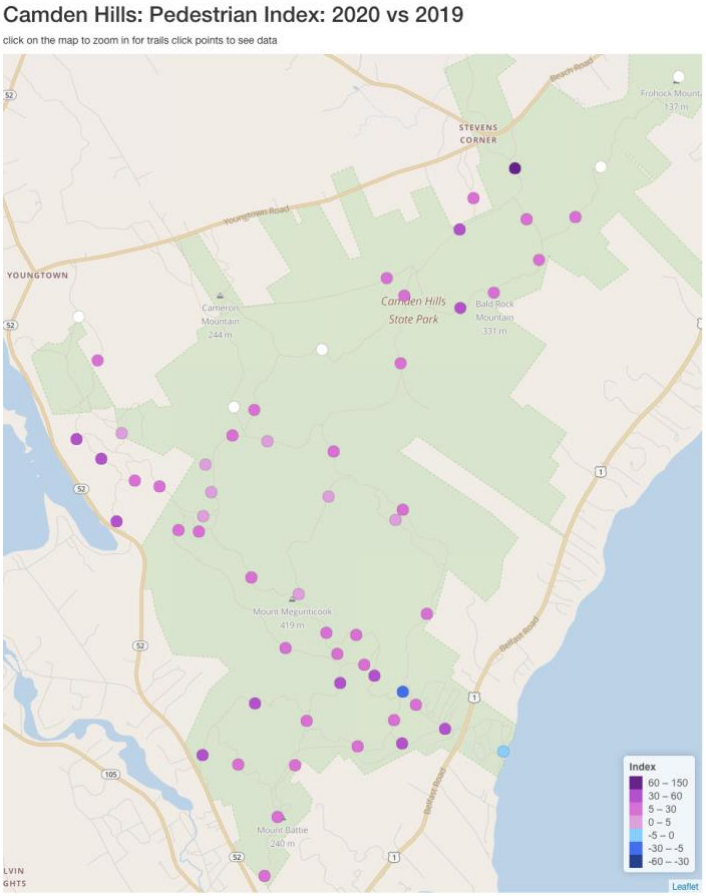


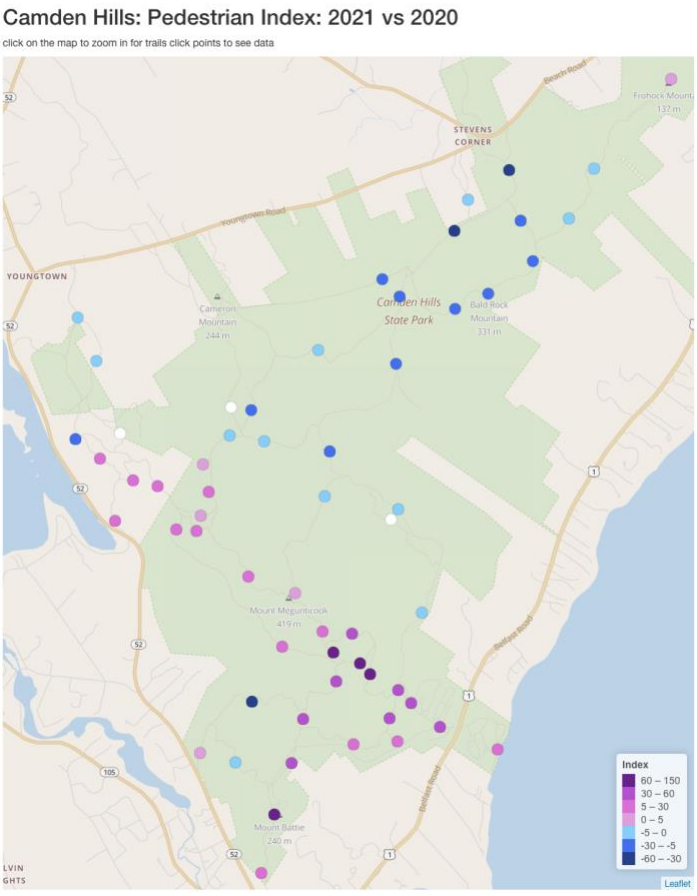

Year-Over-Year Difference of of Pedestrian Index by Trail
Middle Third of Trails
75
50
25
0
2019 to 2020
2020 to 2021
2019 to 2021
Bauneg Beg Mountain
Bethel Pathway
Cliff Trail
Eastern Trail
Great Pond Mountain
Lane Island Preserve
Mt Pisgah
Norway Branch Rail Trail
Whistle Stop Rail Trail


Year-Over-Year Difference of of Pedestrian Index by Trail
Bottom Third of Trails
20
10
0
-10
-20
2019 to 2020
2020 to 2021
2019 to 2021
Bond Brook Trail
Downeast Sunrise Trail
Hidden Valley Nature Center
Hills to Sea Trail
Kennebec River Rail Trail
Mt. Agamenticus
Papermill Trail
Pleasant Mountain
Puzzle Mountain
Quarry Road Trails
Roberts Farm Trails

Hikers avoided crowded trails by seeking out less used trails

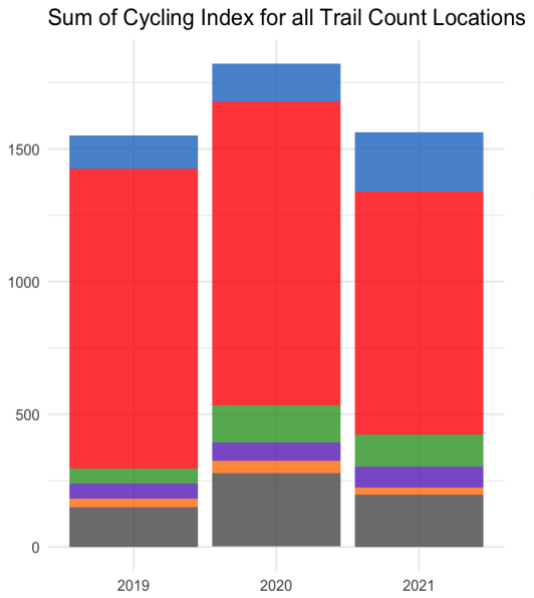
There were anecdotal reports of a higher number of out of state visitors further inland, beyond the Southern Coast, Mid-Coast and Acadian National Park. This trend of increased of trail use in more remote areas is illustrated in Camden Hill State Park. Trails in the middle have a low index value in 2019 (see p.9). The map of year over year difference of index value from 2019 to 2020 shows that the index for all trail segments in the park increased in 2020. In 2021, the index for the middle northern trails decreases, indicating that the increased trail use was temporary. However, the park's most popular trails sections - Mt Megunticook, Maiden Cliff, Mt Battie have even larger increases of pedestrian traffic in 2021.

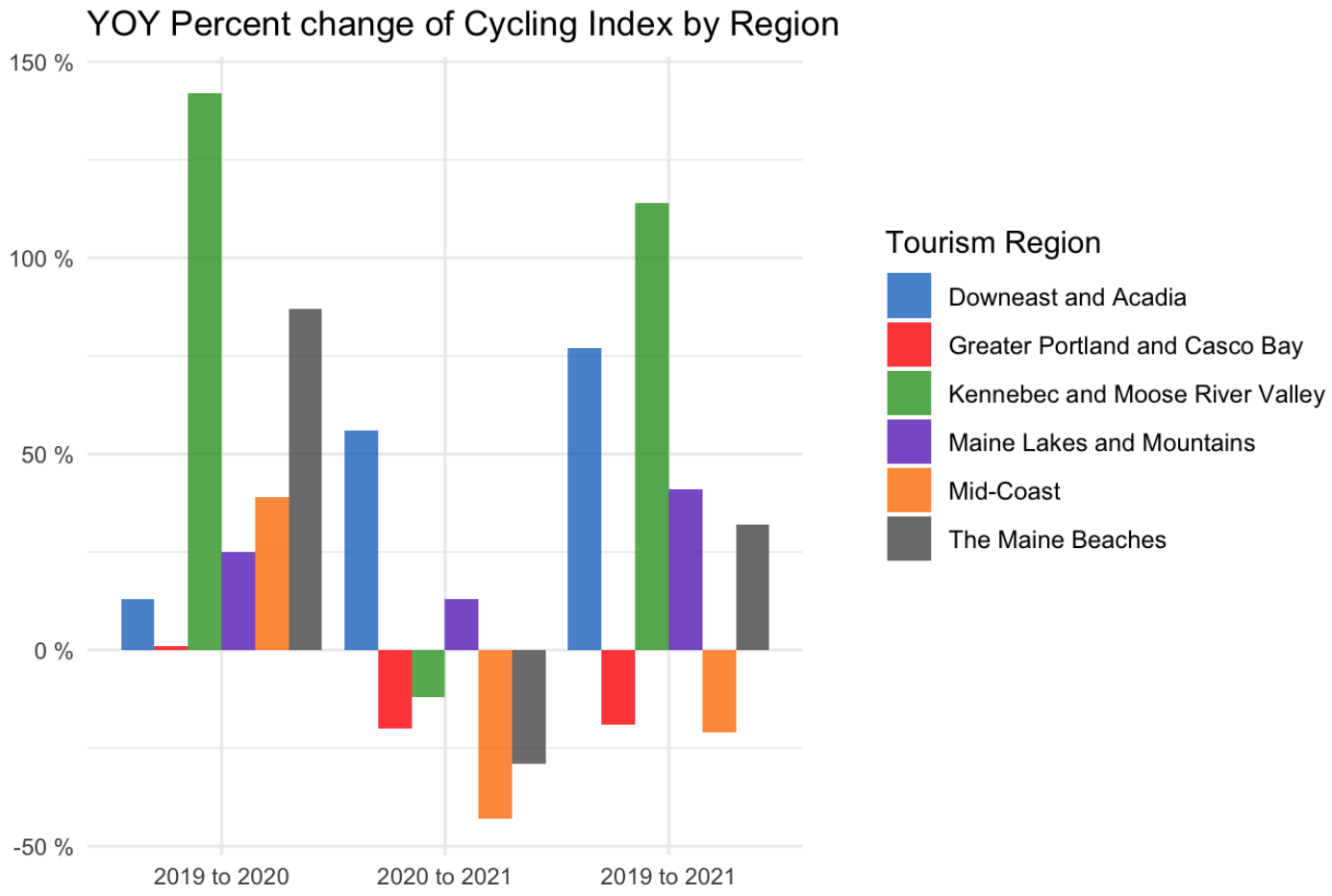




Cycling activity increased in 2020 and returned to the 2019 baseline in 2021

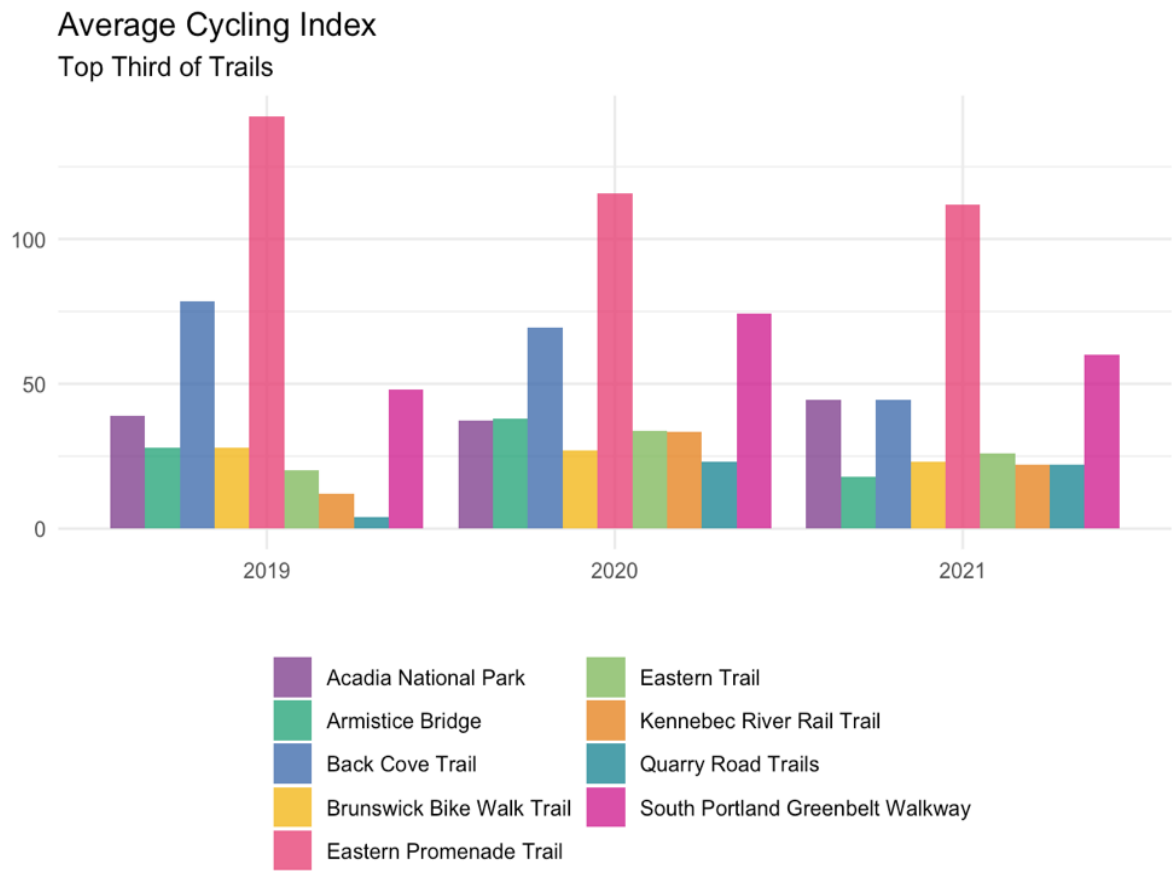
The cycling index across the 89 monitored sites increased by 18% in 2020 compared to 2019, and then returned to the 2019 baseline in 2021. The Kennebec and Moose River Valley, Maine Beaches and the Mid-Coast regions follow this general trend. The Downeast & Acadia region has continued to increase in 2021 relative to 2020, whereas cycling in the Portland area trail locations has decreased in both 2020 and 2021 relative to 2019.



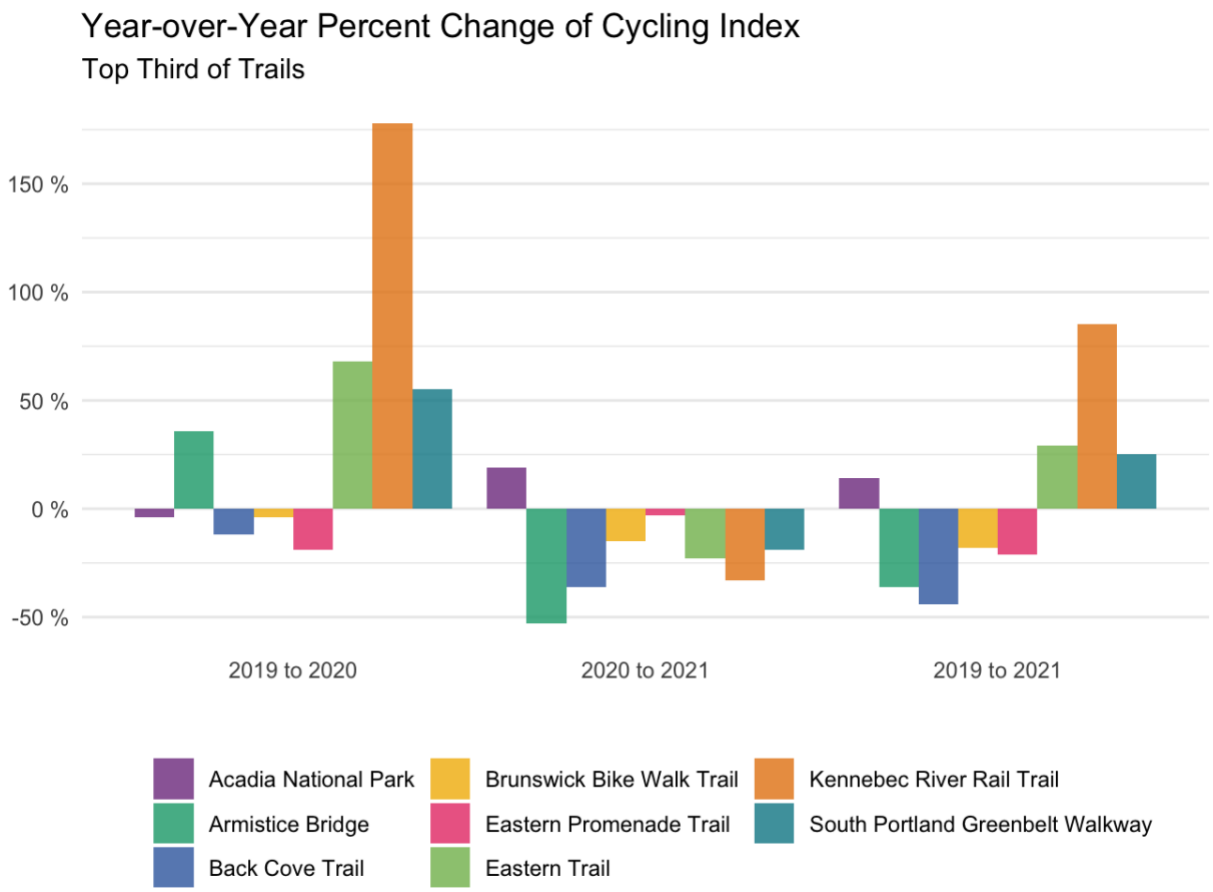


Trails with the highest cycling index from 2019 to 2021

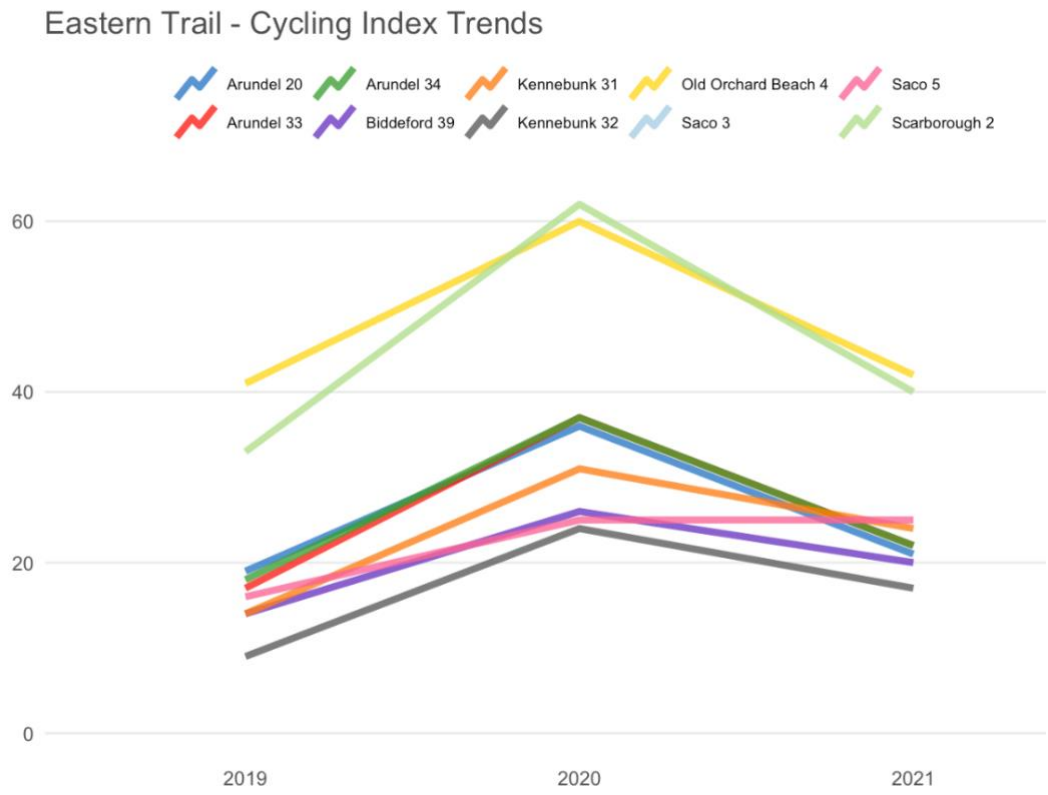
Portland's waterfront trails – Back Cove and Eastern Promenade – have the highest baseline cycling index in 2019, but have decrease in use in 2020 and 2021. This decrease in cycling stands in contrast to the increased pedestrian activity along the same trails.



Meanwhile, multi-use paths connecting mid-size towns and cities, such as the Kennebec River Rail Trail in Augusta, the Eastern Trail in York County, and the South Portland Greenbelt Walkway, increased by over 50% in 2020 relative to 2019, and while they have slightly decreased in 2021, they have still increased in usage compared to the pre-pandemic baseline.



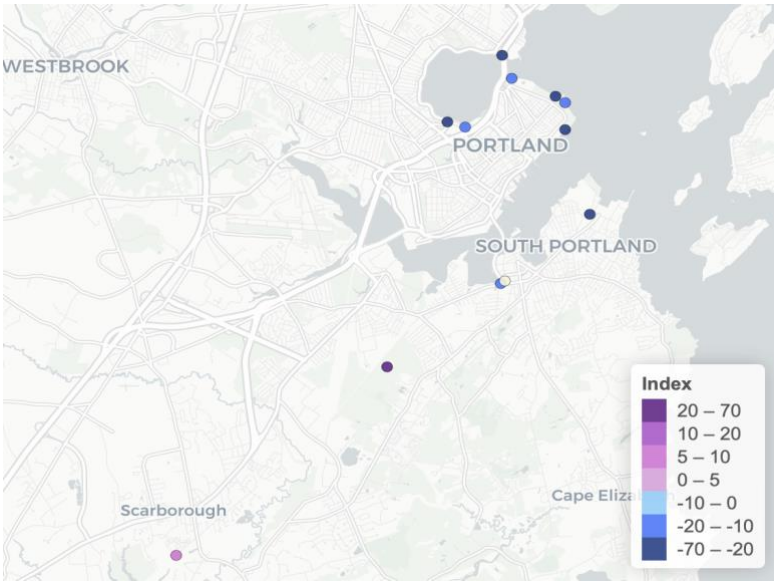
Each of the 10 sites monitored along the Eastern Trail, increased cycling usage in 2020, but then declined in 2021 to just slightly higher than the 2019 baseline. The Scarborough Marsh and Old Orchard Beach are the most used trail locations, more than twice the cycling index over the 8 other sections. Because there are localized areas of higher trail activity, we recommend including multiple count locations for multi-use paths that span long distances.



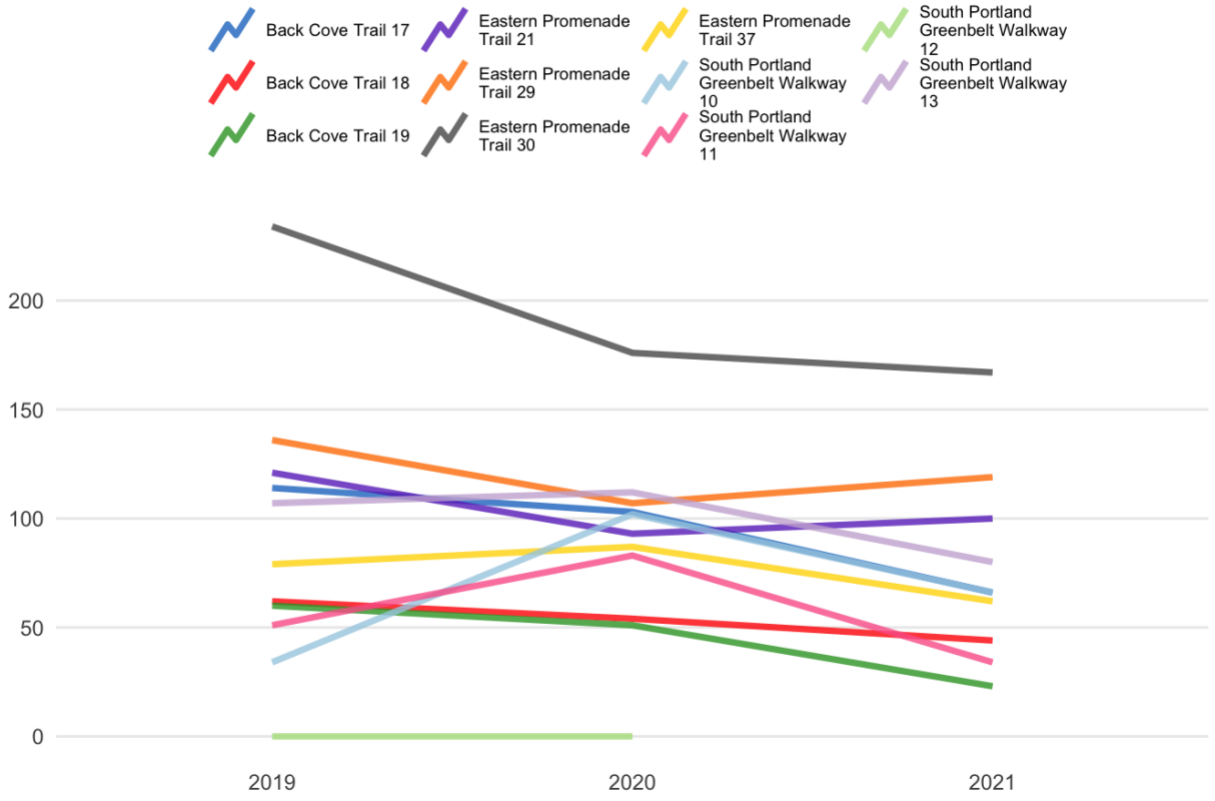
Cycling in the Greater Portland Area decreased in both 2020 and 2021

Contrary to our expectations, the cycling index at most locations in Portland and South Portland decreased in 2020 relative to the 2019 baseline. The decline continued in 2021 compared to 2020, except for the Eastern Promenade Trail. We hypothesize that the decrease in 2020 is due to reduction of commuter cyclist trips as more workers in Portland shifted to working from home. Cycling trips for social or shopping activities may also have decreased during periods of lockdown. Future research could make use of the StreetLight's trip purpose metric to investigate the effect of remote work and lockdowns on cycling patterns in the Portland area.

2020 to 2021 Year Over Year Change in Cycling Index



Portland Area Trails - Cycling Trends



Lessons Learned about StreetLight and Monitoring Use of Trails in Maine

As we assessed baseline and year over year changes in trail usage, we learned numerous lessons to guide future uses of the StreetLight metrics and platform for monitoring trail use in Maine. While StreetLight data have great potential to inform outdoor recreation planning and management in Maine and beyond, opportunities remain for improving the usefulness of the data and for establishing best practices related to the use and interpretation of these data. More broadly, we believe there will be widespread benefits to outdoor recreation managers and stakeholders from improved trail data resources and coordination of use assessments.

StreetLight metrics have great potential to guide future recreation and active transportation monitoring and management in Maine. We demonstrated the utility of StreetLight at capturing relative bicycle and pedestrian use of trails in Maine. Our work to date suggests the StreetLight data in their current form can pick up broad trends in overall use, relative use across sites within a given year, and year to year changes in use. While we are encouraged by its potential, we also recognize that the current bicycle and pedestrian indexes do not fully meet the needs of recreation and trail managers and other outdoor recreation stakeholders. For example, the reported metrics do not correspond with estimates of park visitors. In addition, StreetLight did not generate bicycle and pedestrian indices consistently for our 181 trail locations, and requests for demographic information appeared to introduce privacy issues at numerous locations.

Nonetheless, we learned much from this initial application. Consistent with our work using StreetLight to assess vehicle counts (Ballingall et al. 2021), we have more confidence in estimates generated over longer periods of time (i.e., years rather than days or weeks). We are encouraged by the work done in Camden Hills State Park and believe such focused applications going forward have great potential to inform maintenance and investment decisions. In combination with emerging insights shared by researchers and planners in

other regions, we remain hopeful that StreetLight resources could benefit outdoor recreation and active transportation stakeholders in Maine going forward.

Using StreetLight metrics in combination with traditional counts of trail usage for validation will strengthen future applications in Maine. Consistent with findings from other applications (e.g., Lawson 2021, Creamy et al. 2021), we believe StreetLight metrics are best used in combination with traditional count estimates at this time. The StreetLight bicycle and pedestrian indices can be used to compare trends over time and geographies in each mode, starting in 2019. Since StreetLight products rely on algorithms, the InSight platform and data products will generally perform better in locations with more usage, and performance will be strengthened by opportunities for validation, training of algorithms, and calibration.

Maine trails are located in a variety of landscapes and support a variety of recreation and active transportation modes. We selected our site locations based on feedback from collaborators. In future applications, more systematic selection of site locations could strengthen outcomes. For example, if we had access to numerous physical counts across time and locations, we could validate and calibrate the StreetLight Indexes, which would then support estimates of bike and pedestrian volume at trail locations throughout the Maine subscription zone, dramatically increasing information about trail use across the State.

Coordinated physical trail counting and StreetLight assessments will accelerate knowledge generation about trail use and advances in the use of StreetLight metrics to inform outdoor recreation planning and management. The primary benefits of StreetLight and other novel data sources to outdoor recreation and transportation planners include the ability to track trip activity and user characteristics without physical counters and user surveys. Physical counters and user surveys are relatively costly, and their costs have prevented widespread adoption. As a result, there are few standardized estimates of recreation sites or bicycle and pedestrian volumes more generally in Maine,

and even fewer such assessments of particular trails. Given the need for data on trail usage and validation of StreetLight and other potential novel data sources, we encourage greater coordination and planning of physical counter usage on Maine trails. Coordinated planning around placement and use of temporary and permanent counters and storage of counter data could benefit multiple groups and inform future assessments of sites and trails as well as applications of StreetLight data or other novel data sources. Synchronizing StreetLight assessments with physical counter assessments (i.e., apples to apples comparisons) would greatly inform future applications and strengthen performance, validation, and calibration.

Continuing to engage with StreetLight will improve calibration of these bicycle and pedestrian indexes to Maine. We have reported our experiences using StreetLight bicycle and pedestrian indexes in Maine to StreetLight, and continued engagement with StreetLight staff about the use of their metrics and the needs of the outdoor recreation and transportation planning community will continue to improve Maine data and algorithms.

Using StreetLight vehicle data may be a strategic option for assessing use at some recreation sites. In situations where general use of a recreation site is of interest, StreetLight vehicle data at parking lots and trailheads may provide better overall visitation information than the bicycle and pedestrian indices. While such applications will not provide information about specific trails, they could provide valuable information about general usage. Use of StreetLight vehicle data will make more sense for recreation sites with dedicated parking lots and fewer trailheads than sites with dispersed parking and numerous access points.

Improved Maine trail data resources will benefit outdoor recreation planning and management. Accessible information and data about Maine trails will help future research and planning efforts, regardless of whether StreetLight data are used. Online and publicly available information about trail locations (e.g., GIS trail inventory), trail attributes (user modes, timing of use by different modes), and trail counts could help structure future assessments of trail use, trail users, and their economic contributions and impacts. Such

inventories could help identify and group trail monitoring sites and permit tailored applications of StreetLight and other types of analyses. In our work, we generated StreetLight metrics for all locations similarly. Additional information about the trails and their general usage patterns could have facilitated analyses with different analysis parameters (such as annual or monthly trail activity trends) across distinct groupings of trail locations.

CONCLUSIONS

By doing this work, we advanced understanding of new approaches for user monitoring and new sources of data to document trail use in Maine. We also helped improve knowledge of the use of recreational and multi-use trails in Maine. Overall, we demonstrated that trail usage varies markedly across different locations. We also revealed broad increases in trail use during the initial two years of the COVID-19 pandemic and year to year variation in trail usage across locations. Maps and tables summarizing our baseline and year to year change assessments at 181 locations (see Appendix A and B) provide useful details about our assessments. We hope this report and our findings inspire and guide future research on Maine trail use.

We contributed to an expanding line of research focused on applications of novel data to address critical knowledge gaps related to the use of recreation areas and bicycle and pedestrian trips and the impacts of this usage on communities, regions, and economies (see Lawson, M. 2021 for a recent review). We look forward to doing additional work in this area and collaborating with others to strengthen understanding of Maine's trails, their users, and their myriad contributions and impacts.

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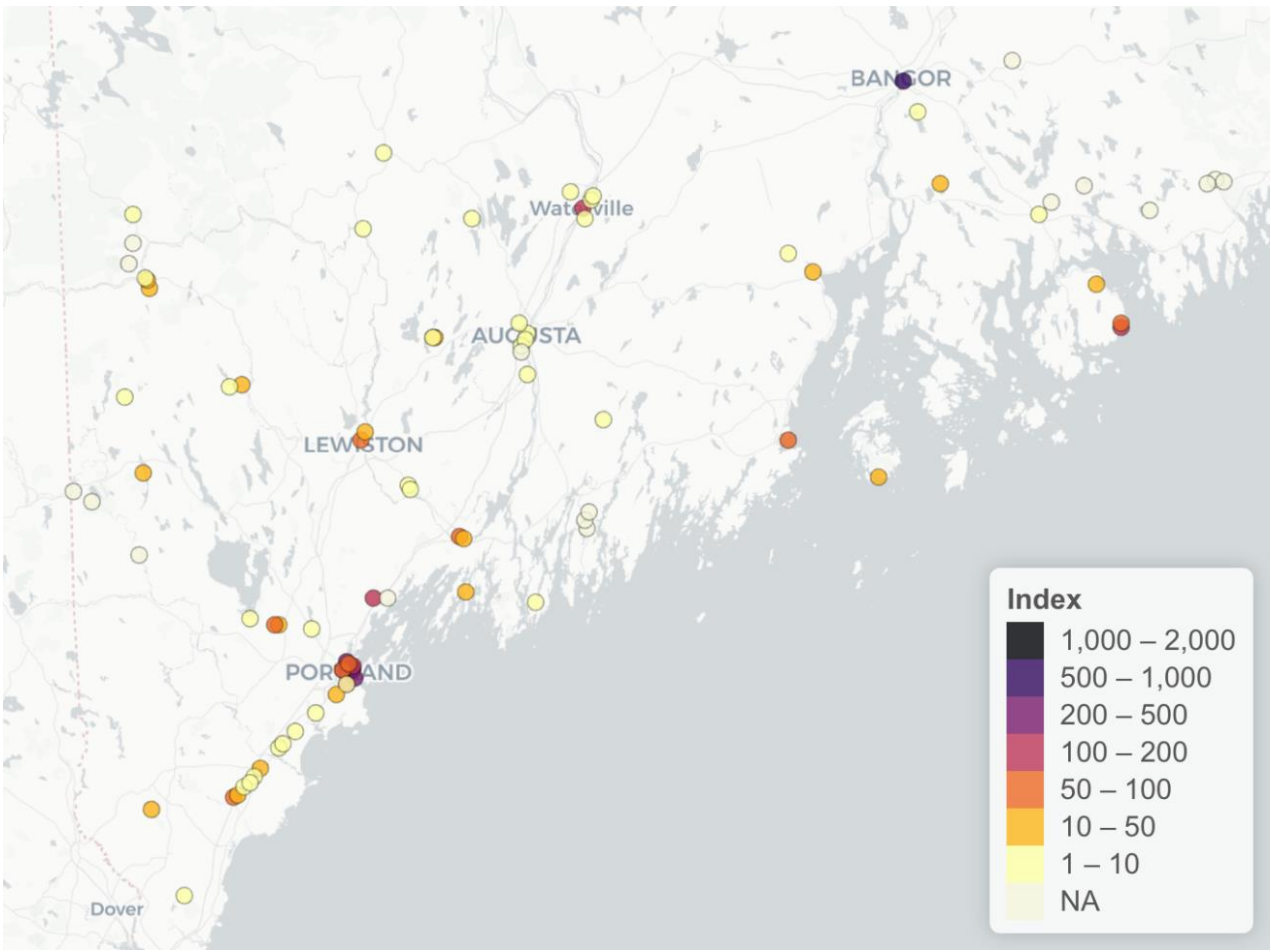
Creany, N. E., Monz, C. A., D'Antonio, A., Sisneros-Kidd, A., Wilkins, E. J., Nesbitt, J., & Mitrovich, M. (2021). Estimating trail use and visitor spatial distribution using mobile device data: An example from the Nature Reserve of Orange County, California USA. *Environmental Challenges*, 100171.

Lawson, M. (2021). Innovative new ways to count recreation: using data from cell phones, fitness trackers, social media, and other novel data sources. Headwater Economics, March 2021. https://headwaterseconomics.org/wp-content/uploads/HE_CountingRecreationReport_2021.pdf

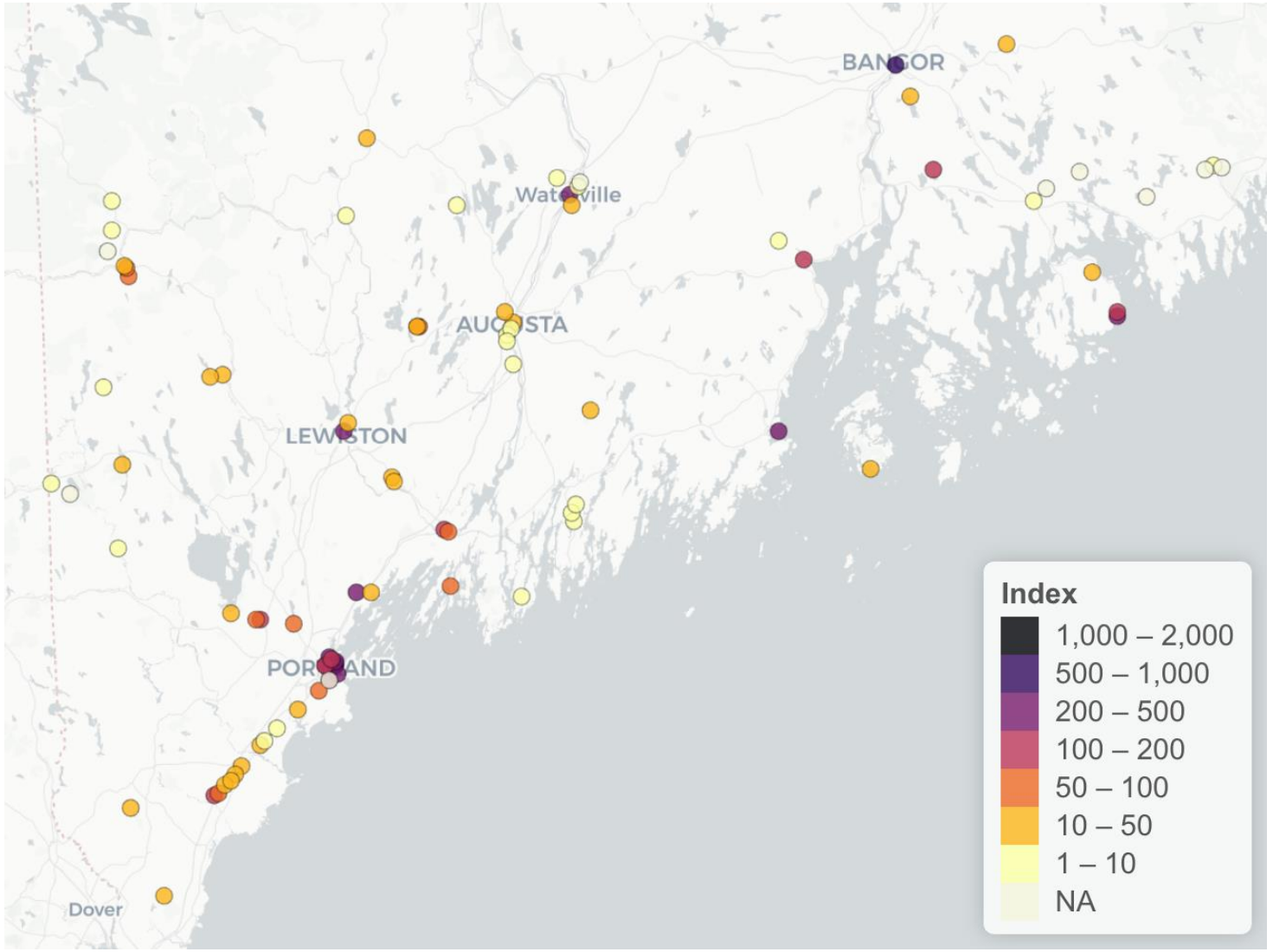
Appendix A Maps of Pedestrian and Cycling Index Metrics

Maine StreetLight Subscription Zone: 89 Locations

2019 Pedestrian Index



2020 Pedestrian Index



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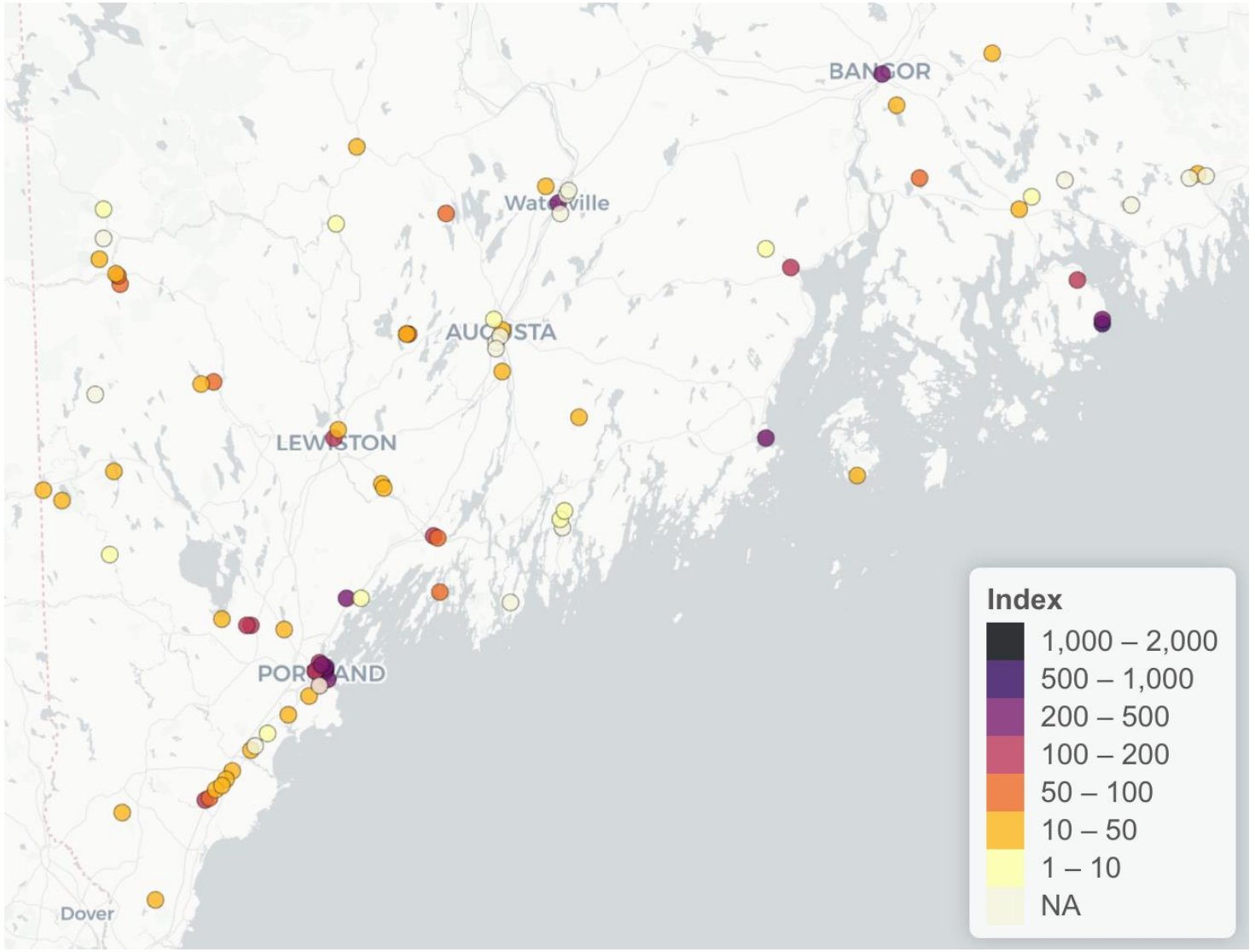
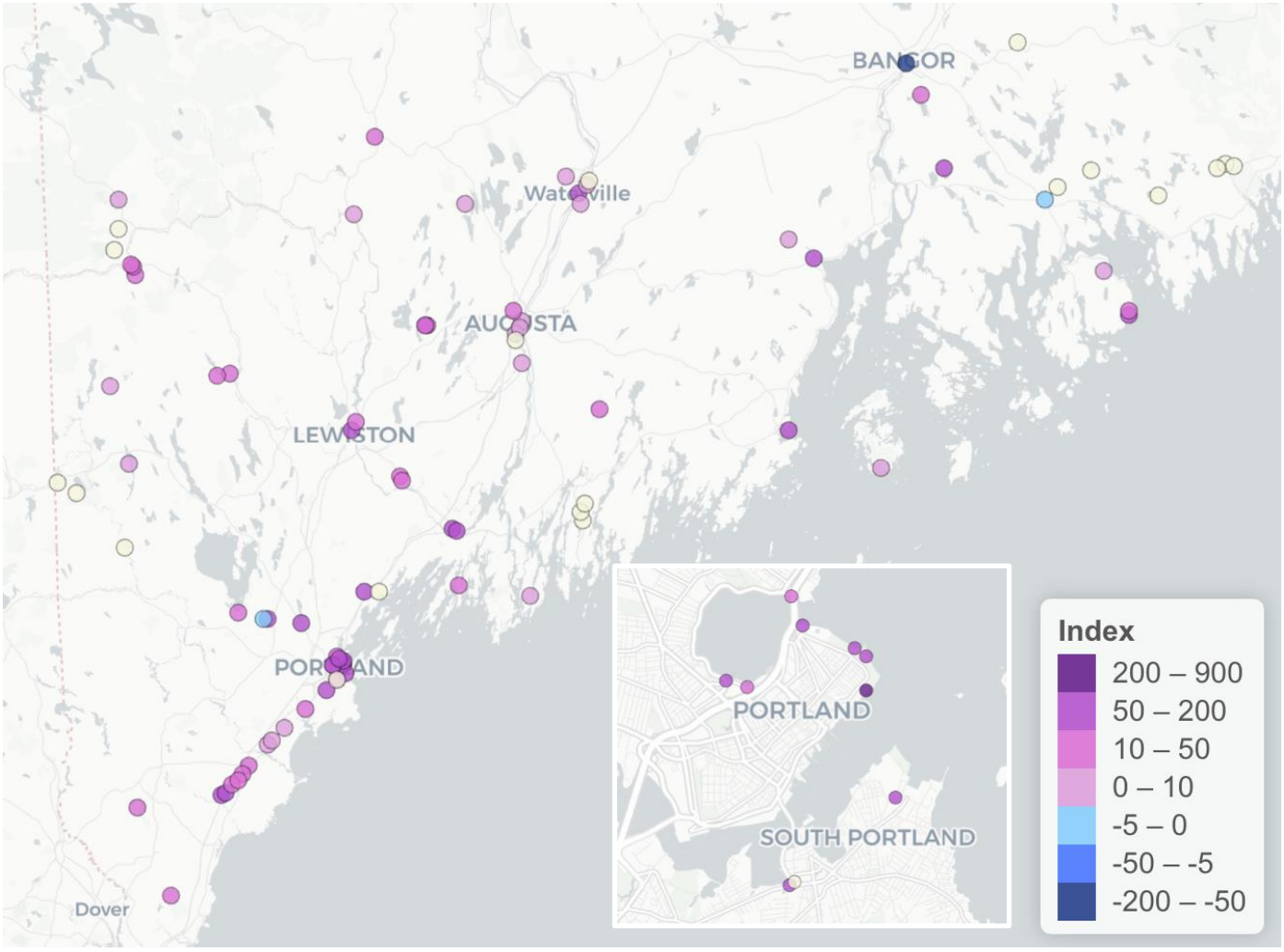


Difference of Pedestrian Index, 2020 vs 2019



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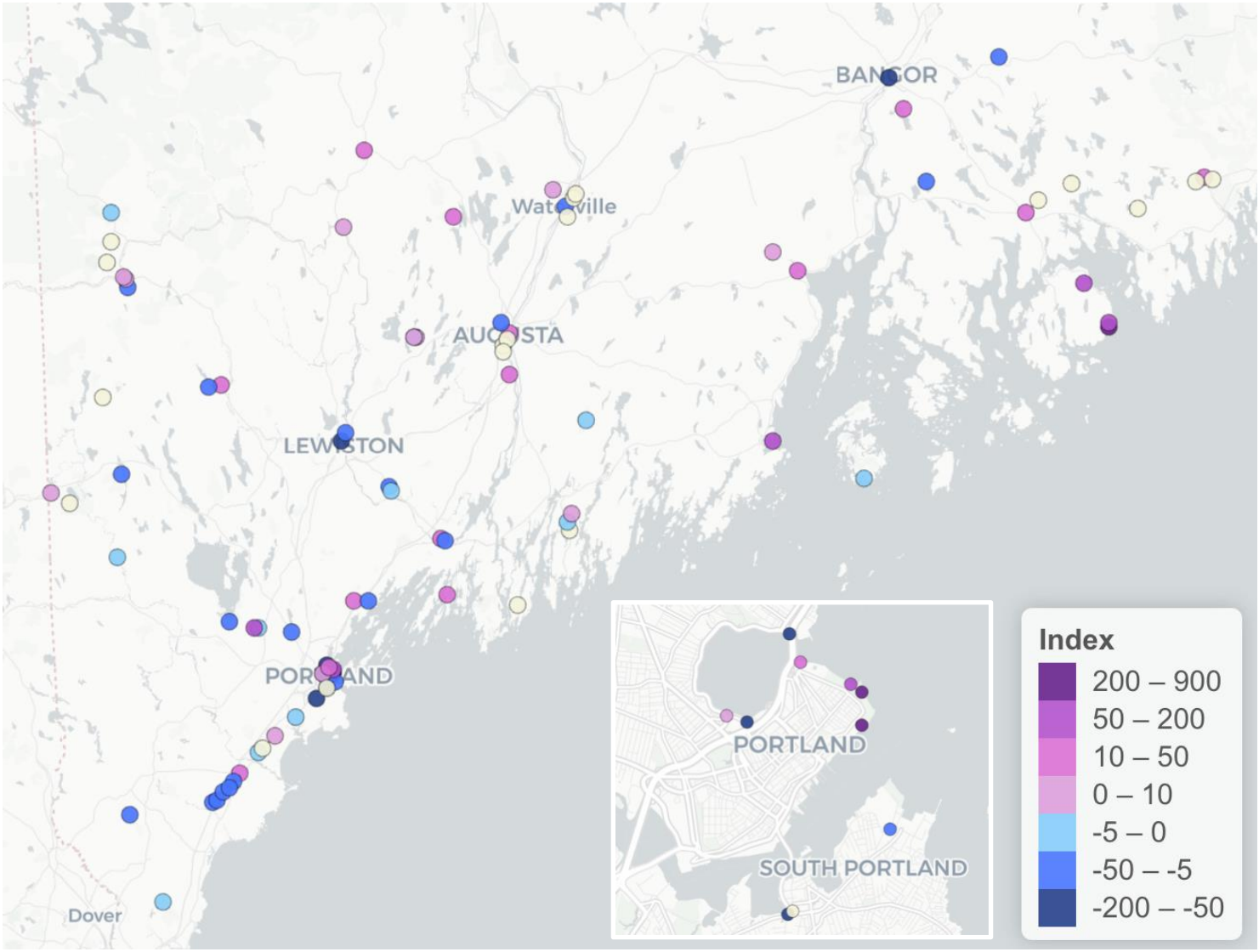

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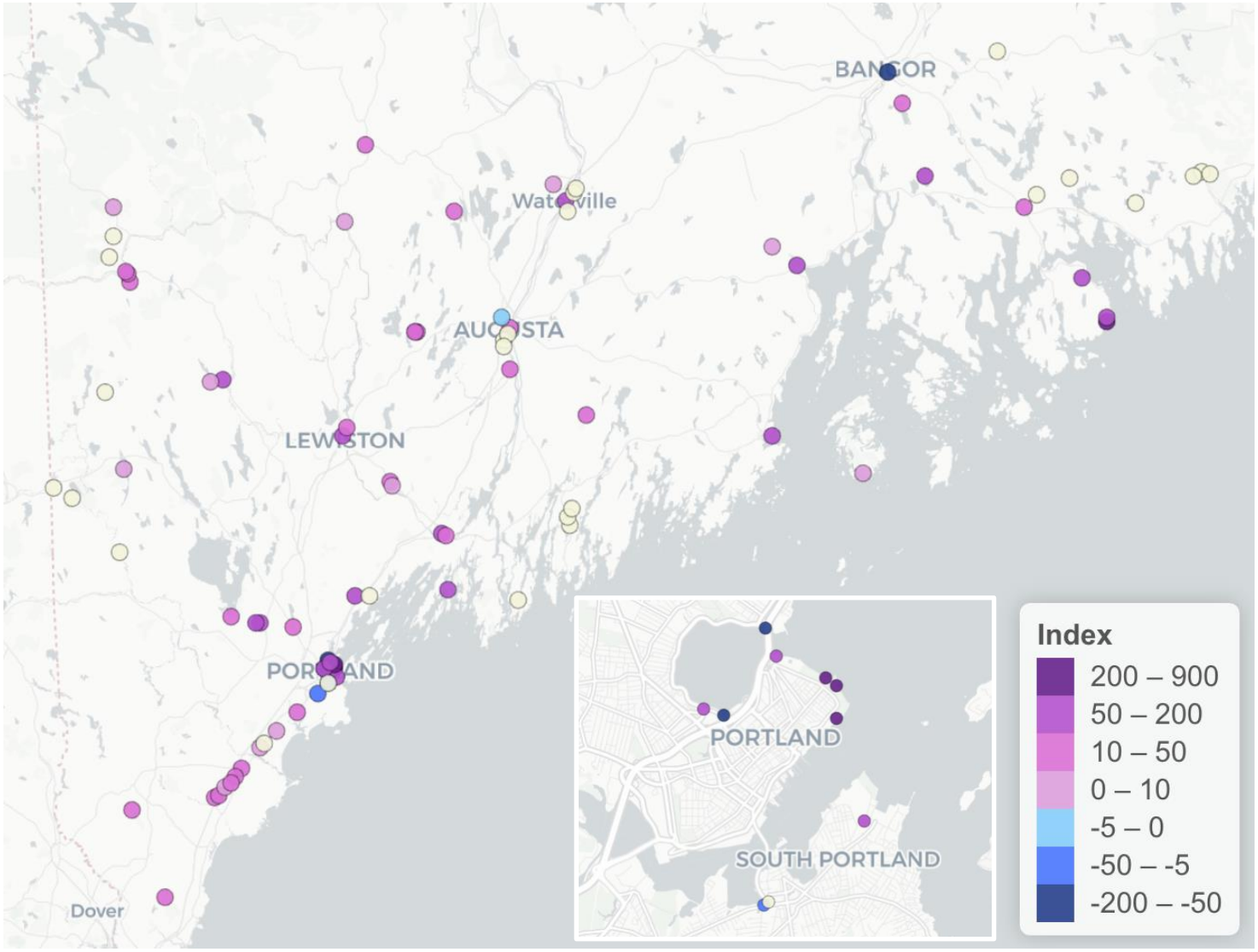
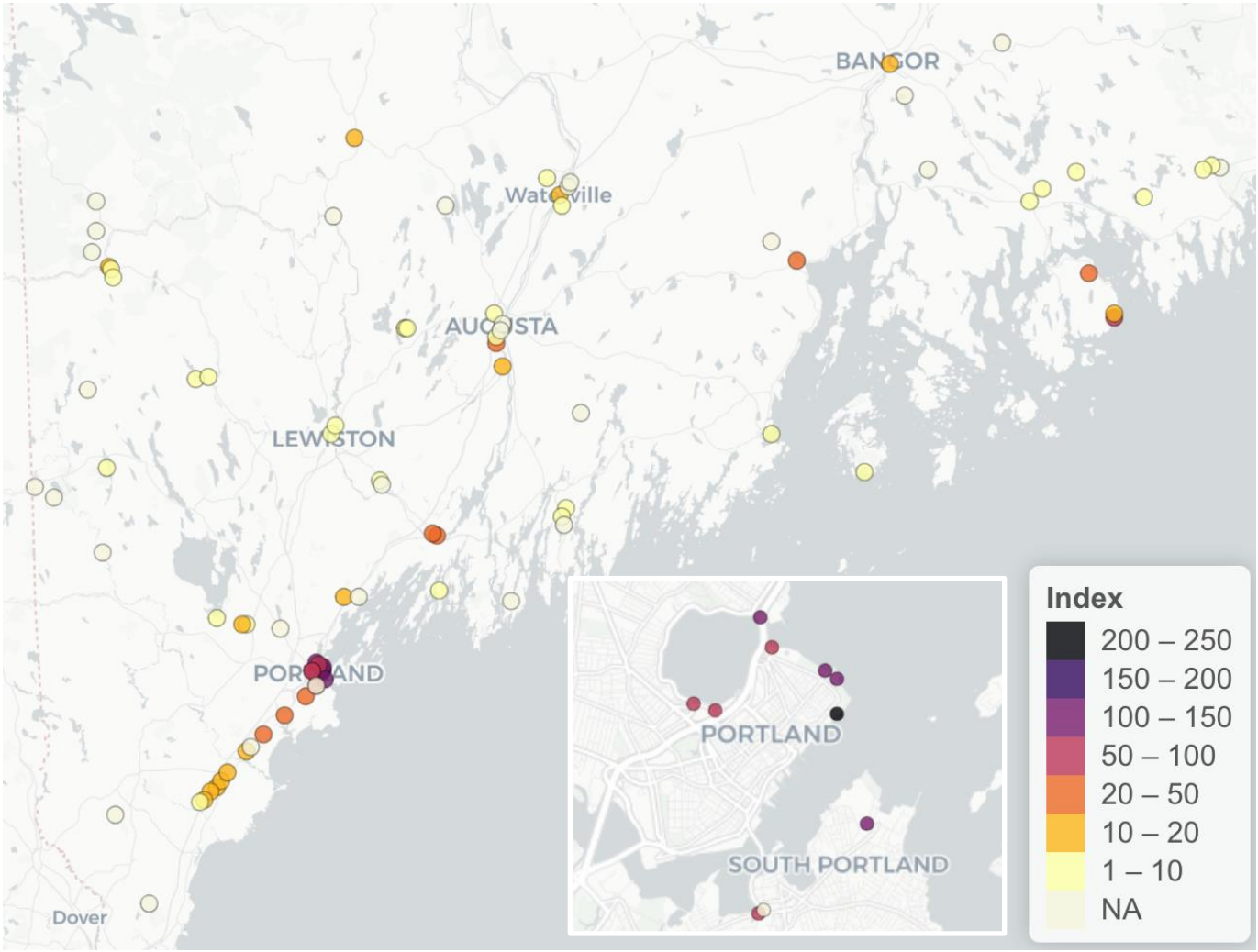


2019 Cycling Index



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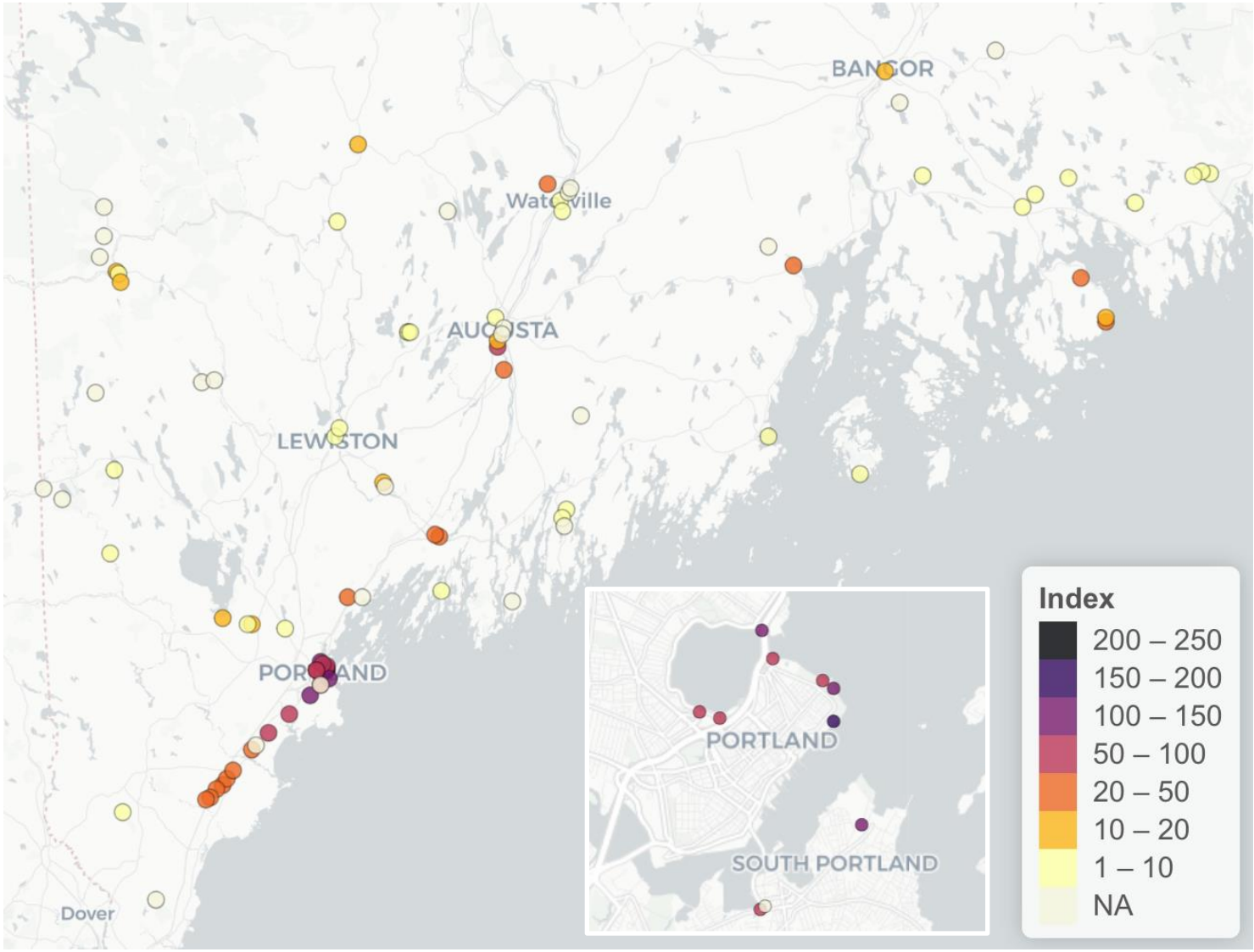

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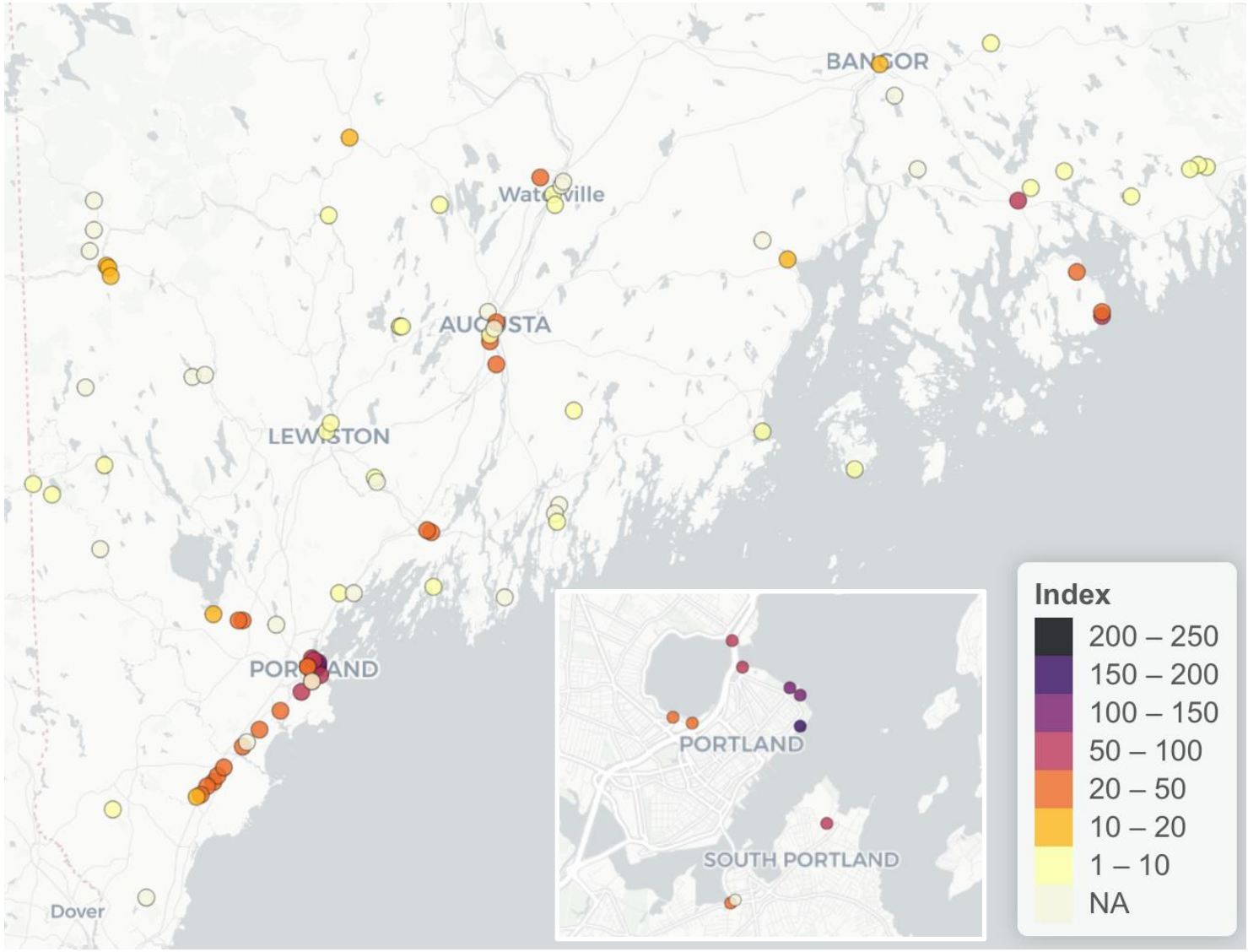

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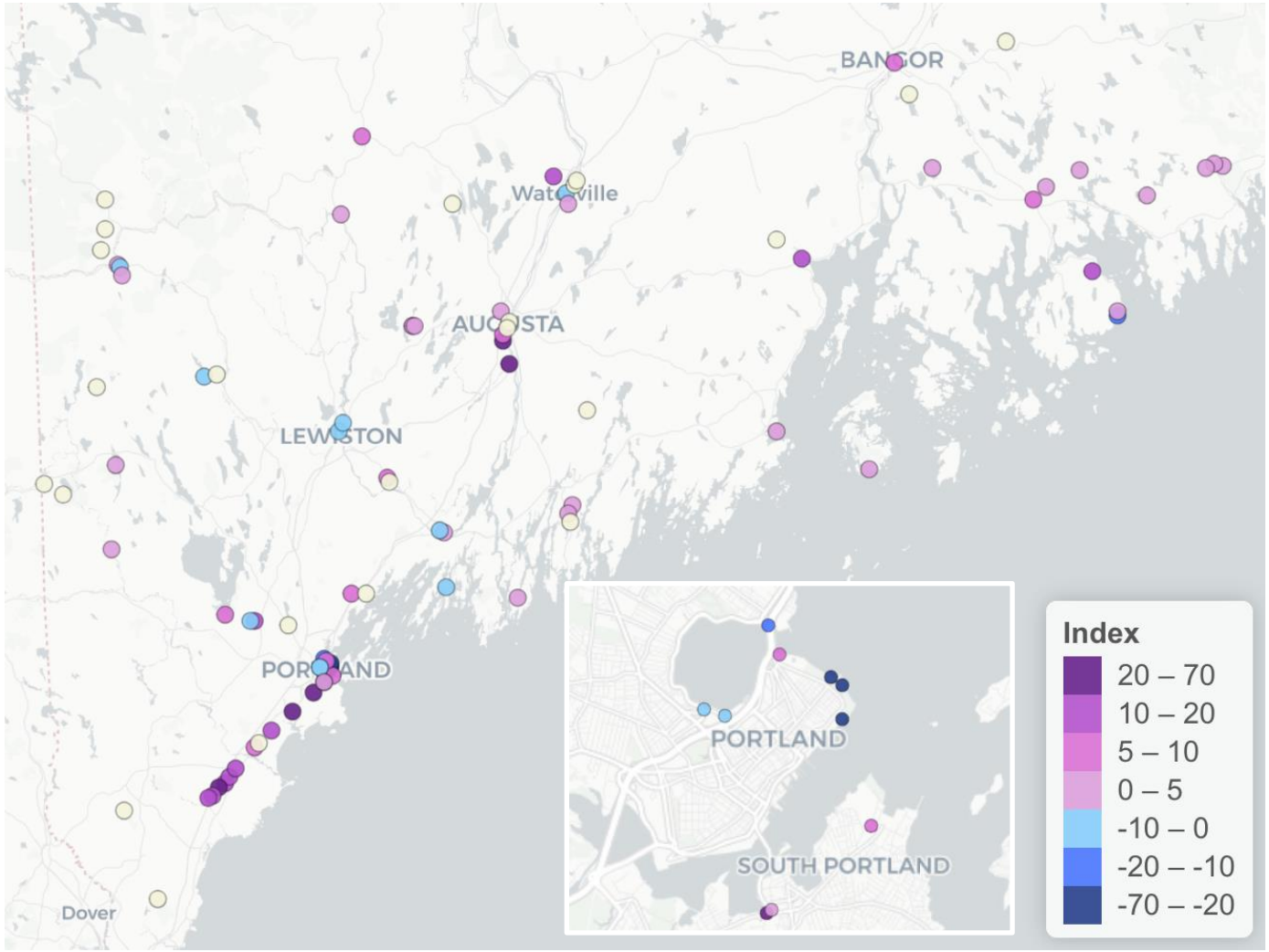

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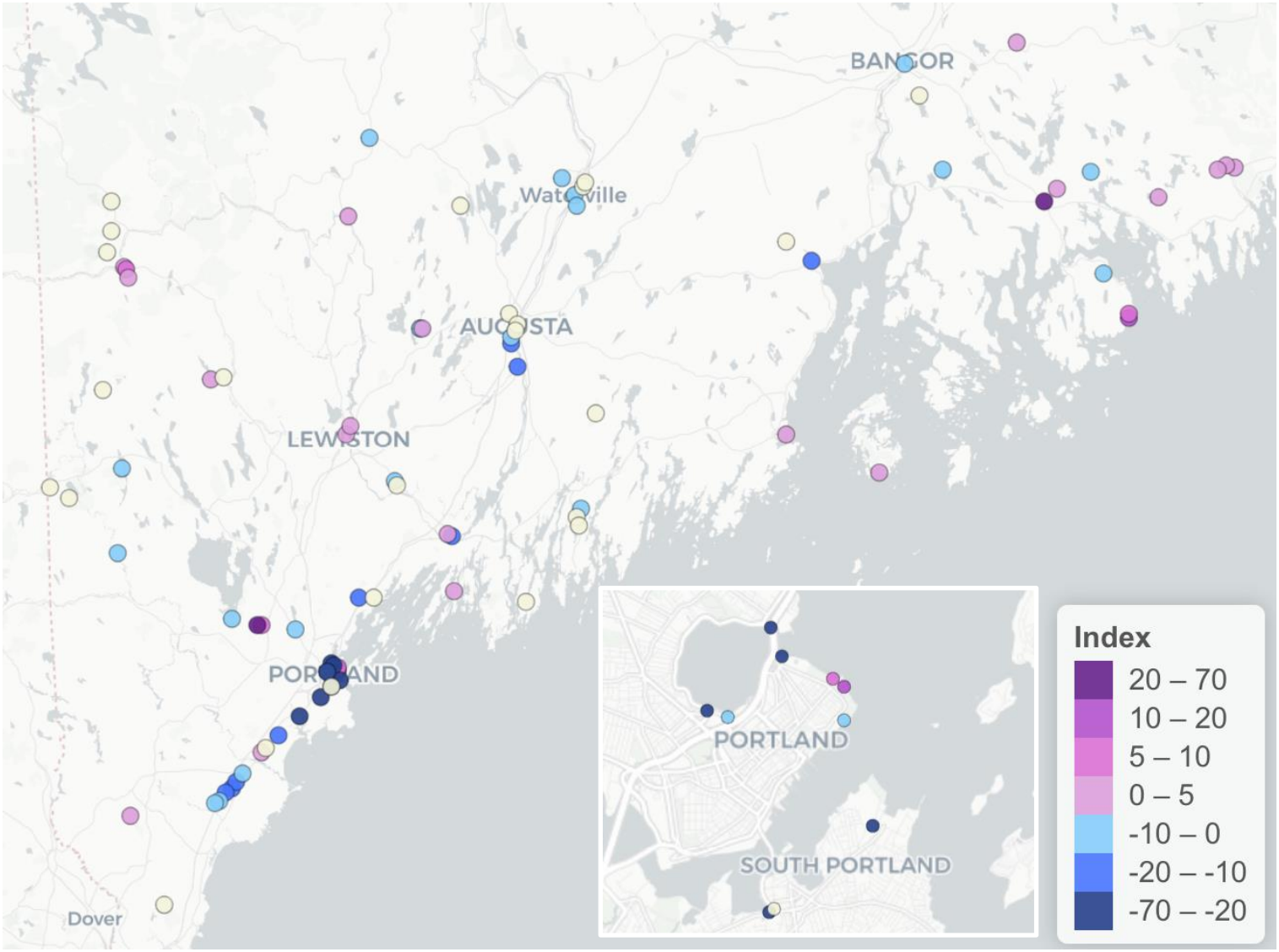

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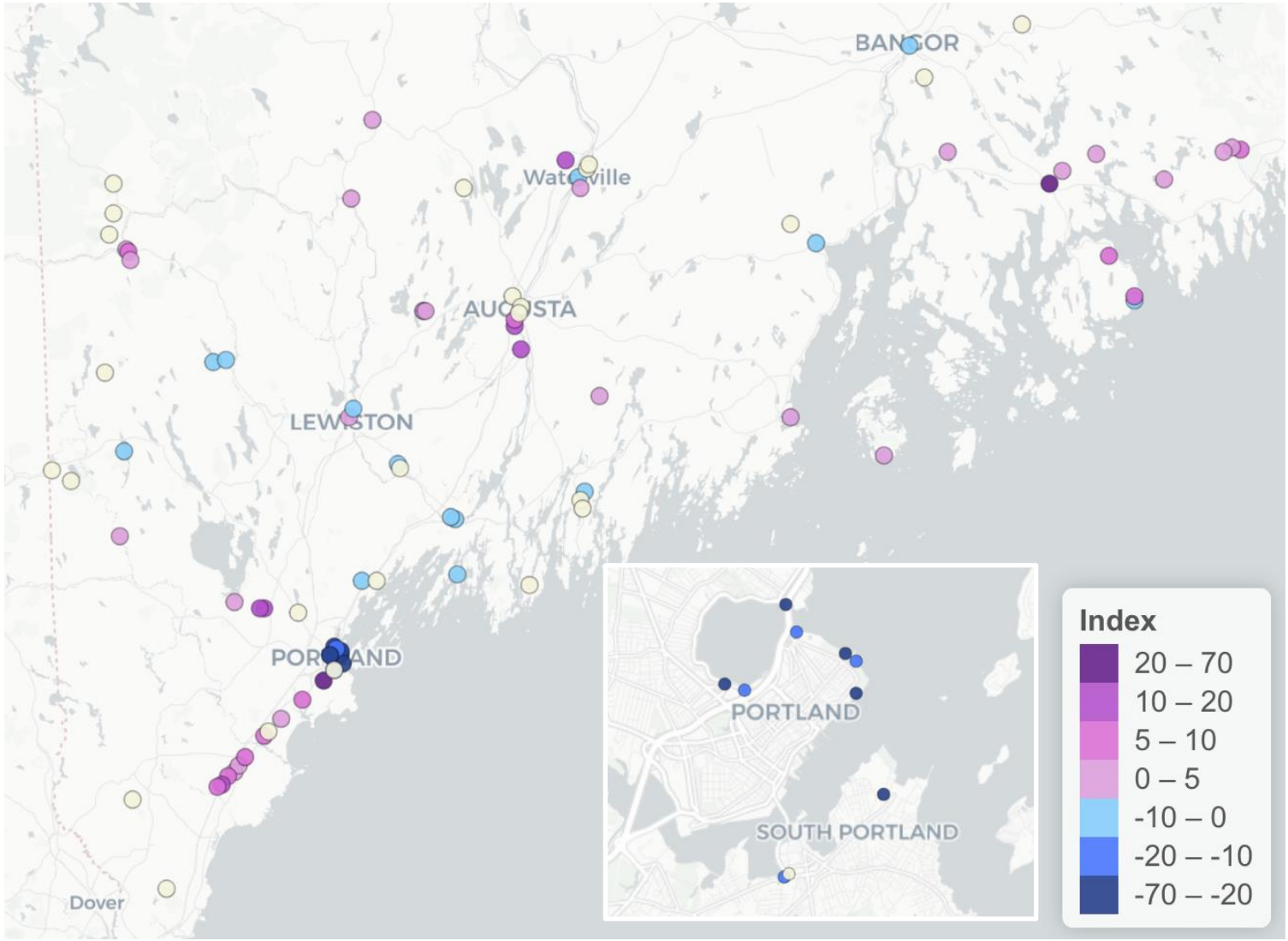
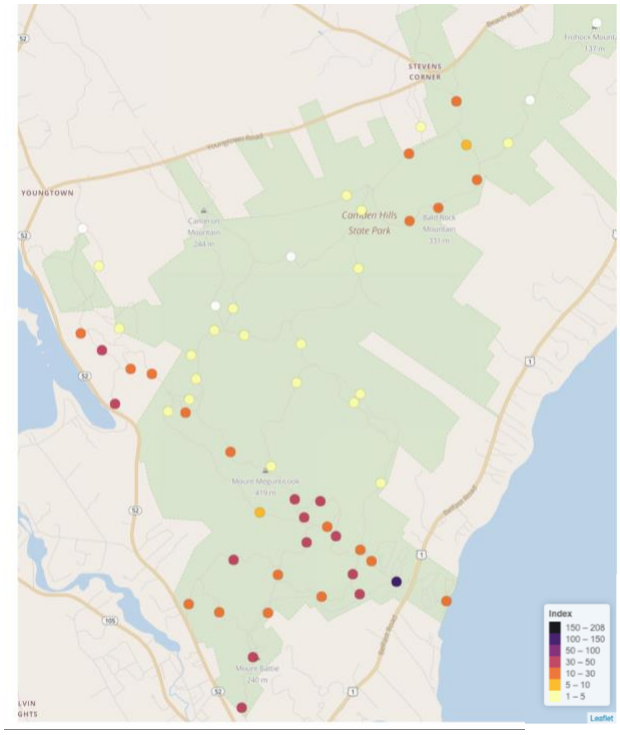
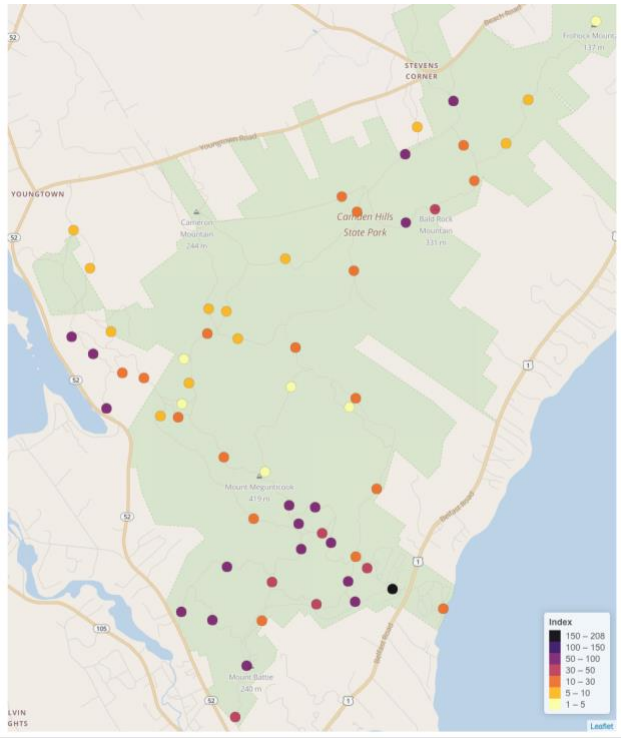
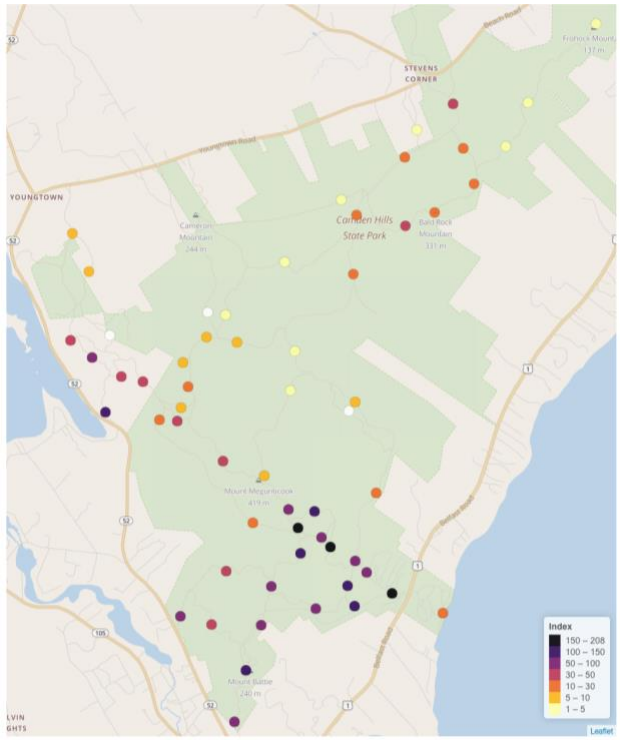


Camden Hills State Park

2019 Pedestrian Index	2020 Pedestrian Index	2021 Pedestrian Index
		

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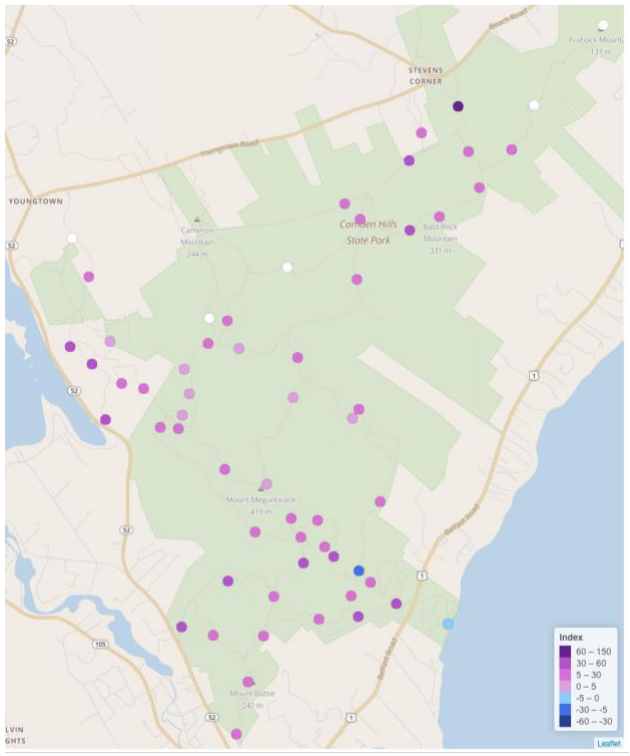
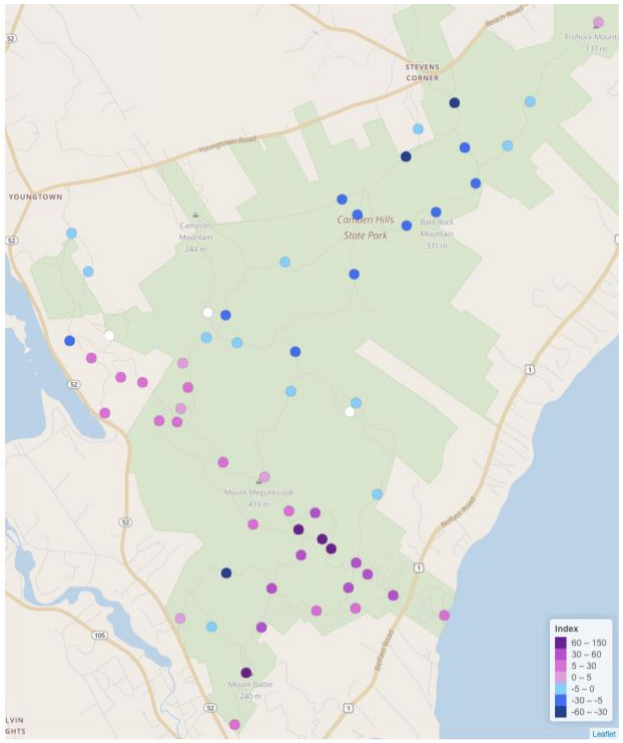
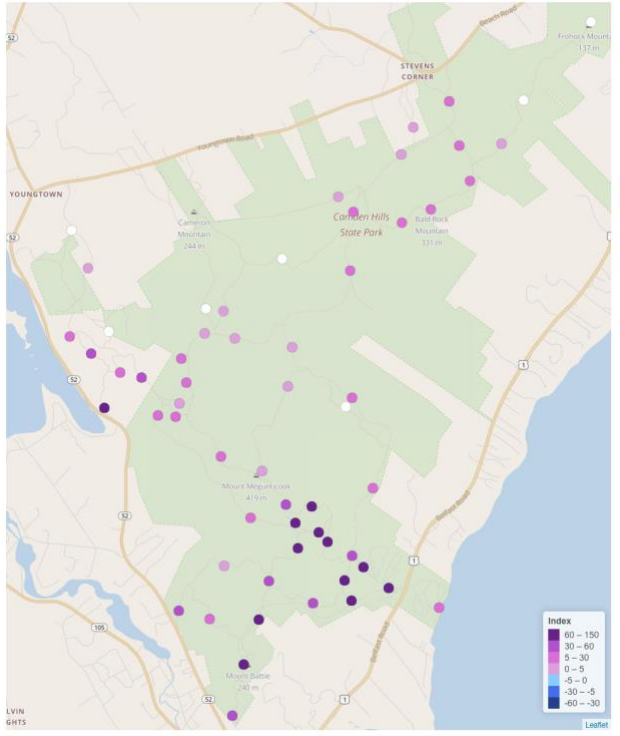
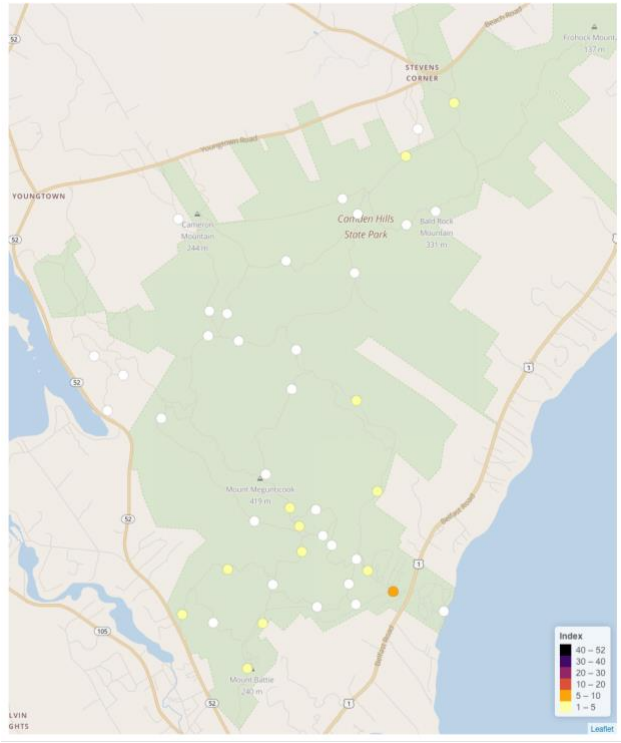
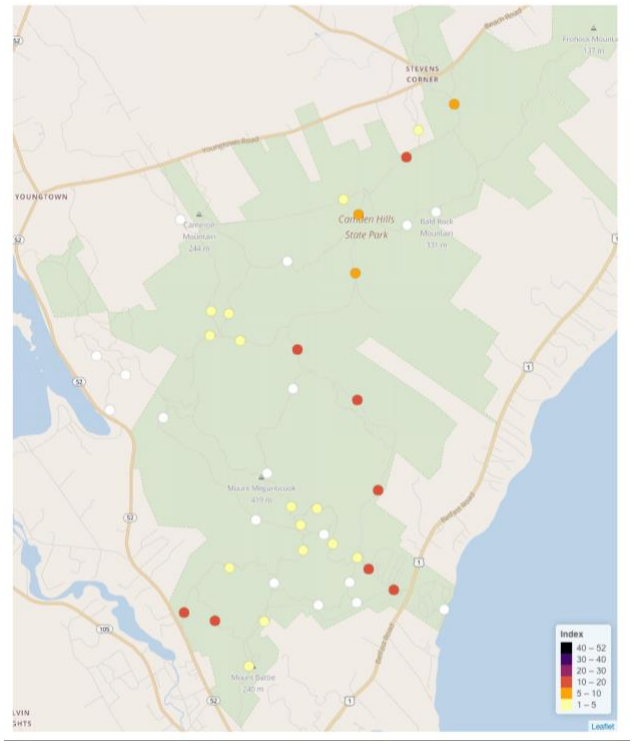
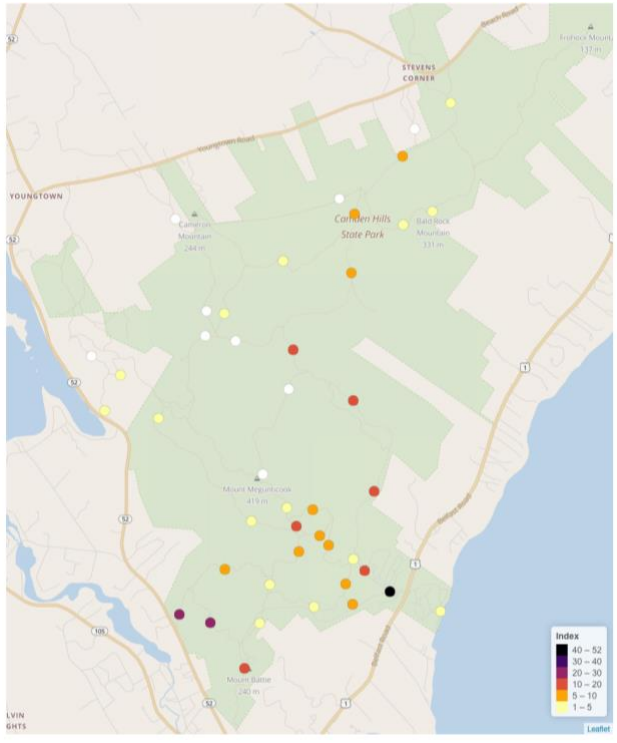
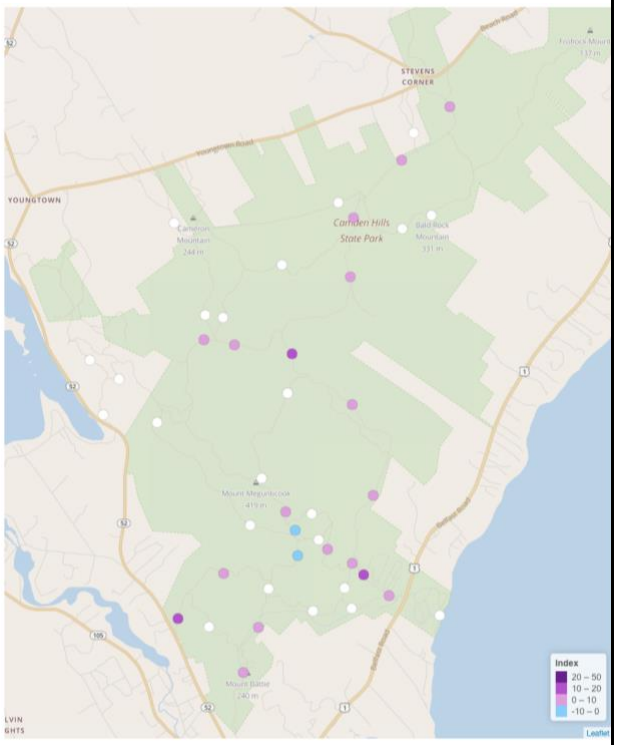
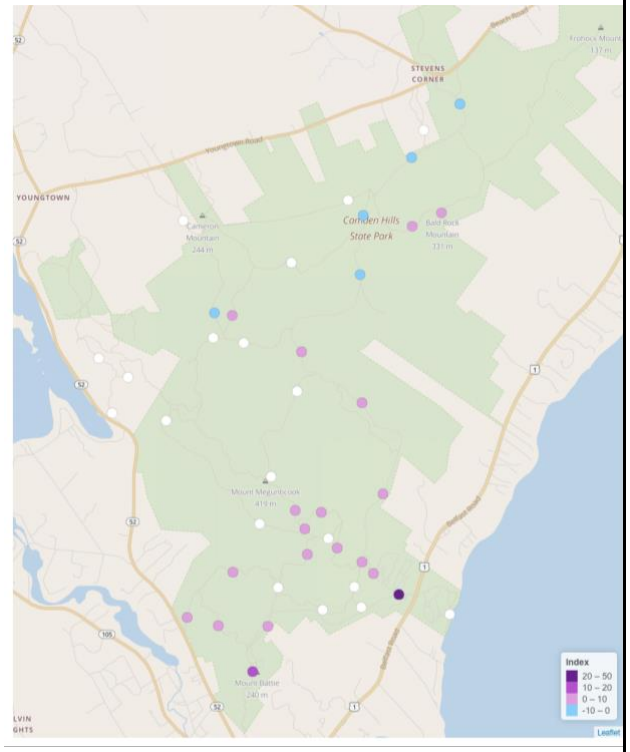
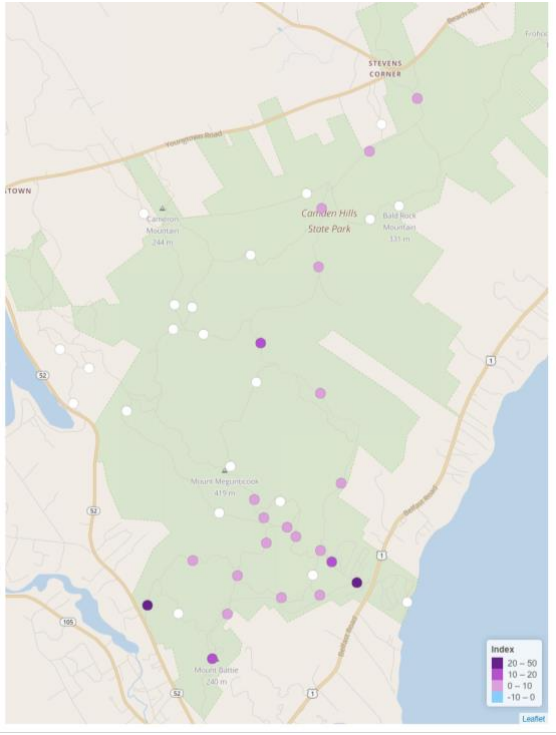
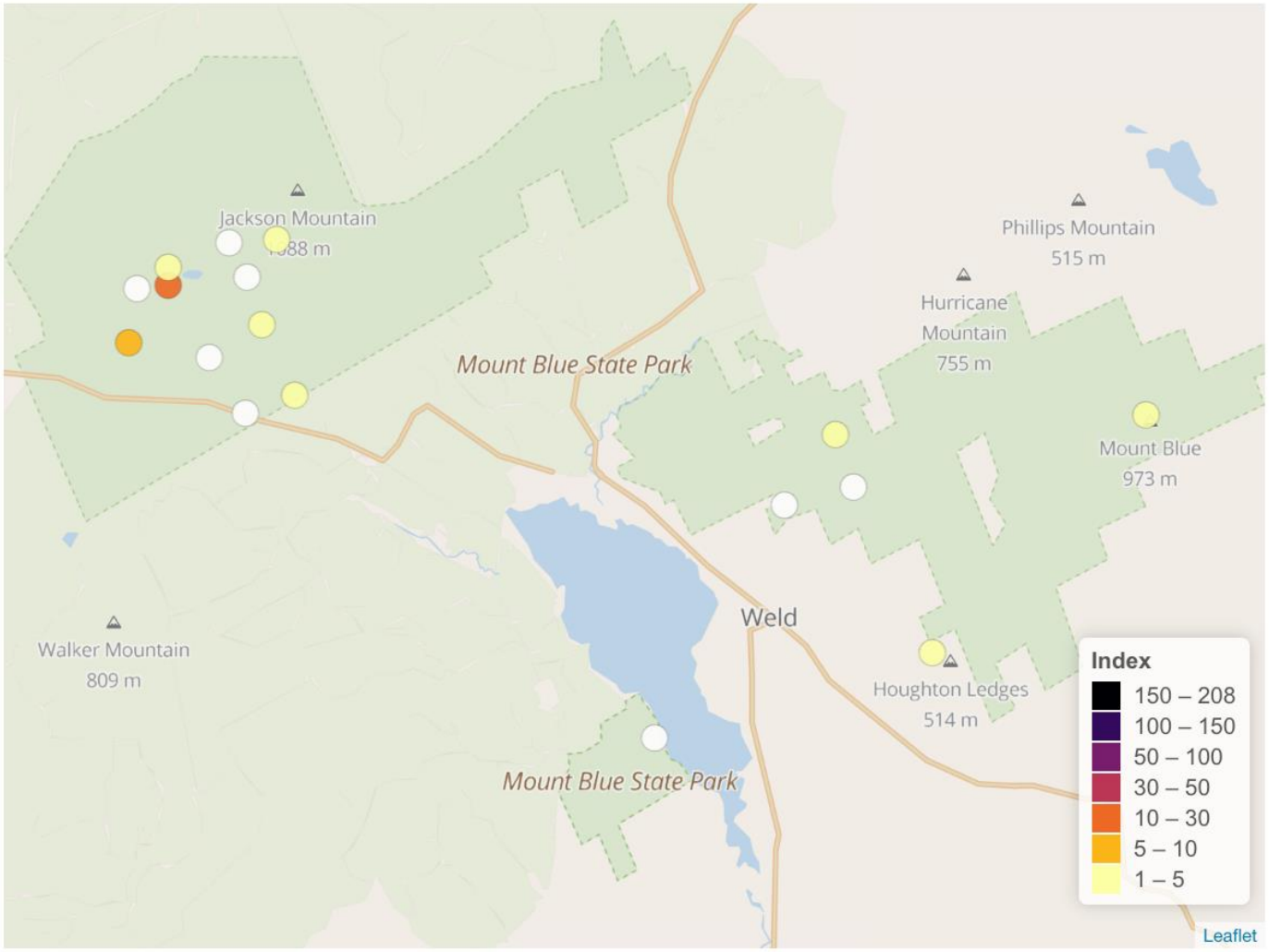
		

2019 Cycling Index	2020 Cycling Index	2021 Cycling Index
		

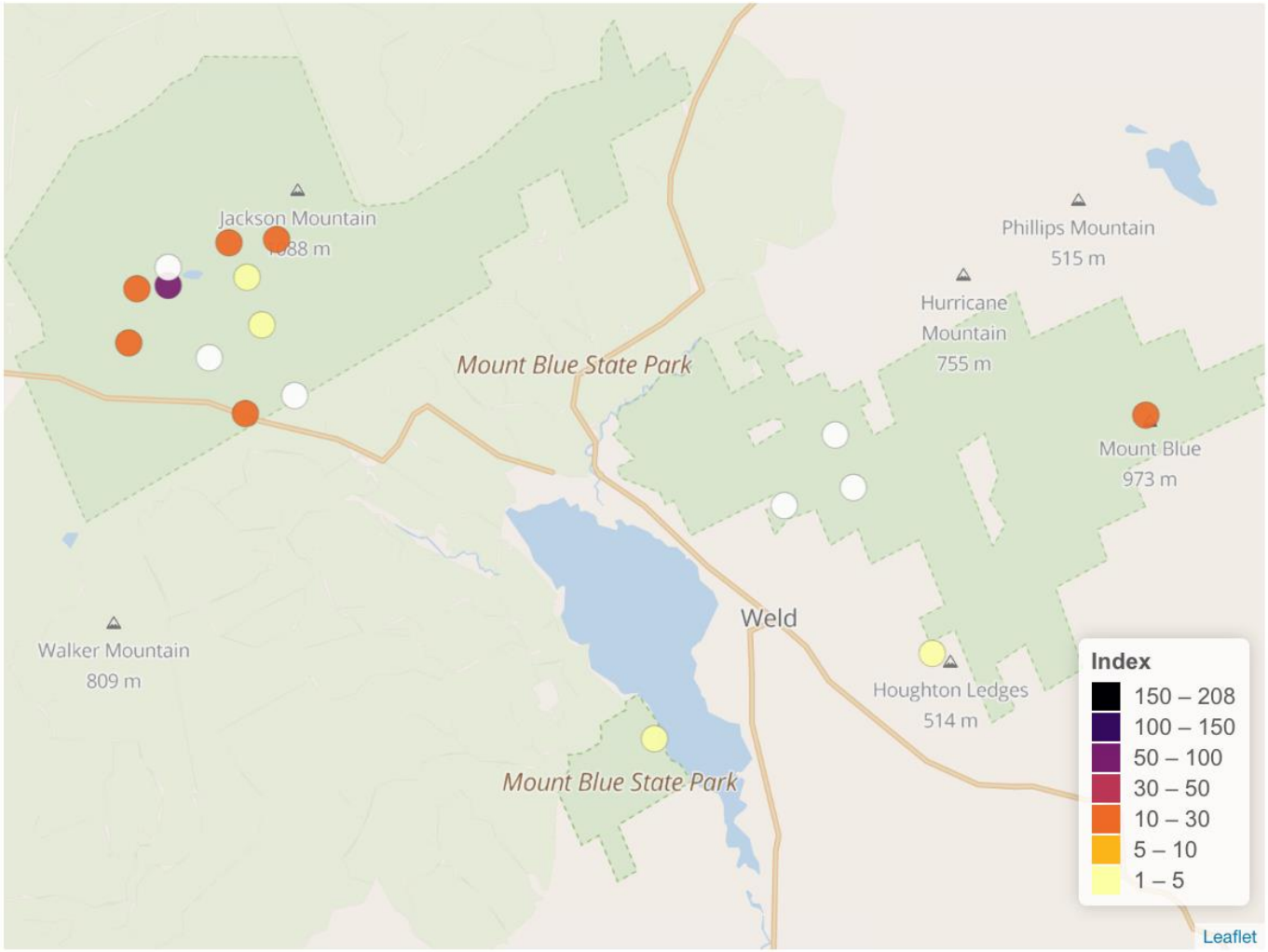
Difference of Cycling Index 2019 to 2020	Difference of Cycling Index 2020 to 2021	Difference of Cycling Index 2019 to 2021
		

Mount Blue State Park

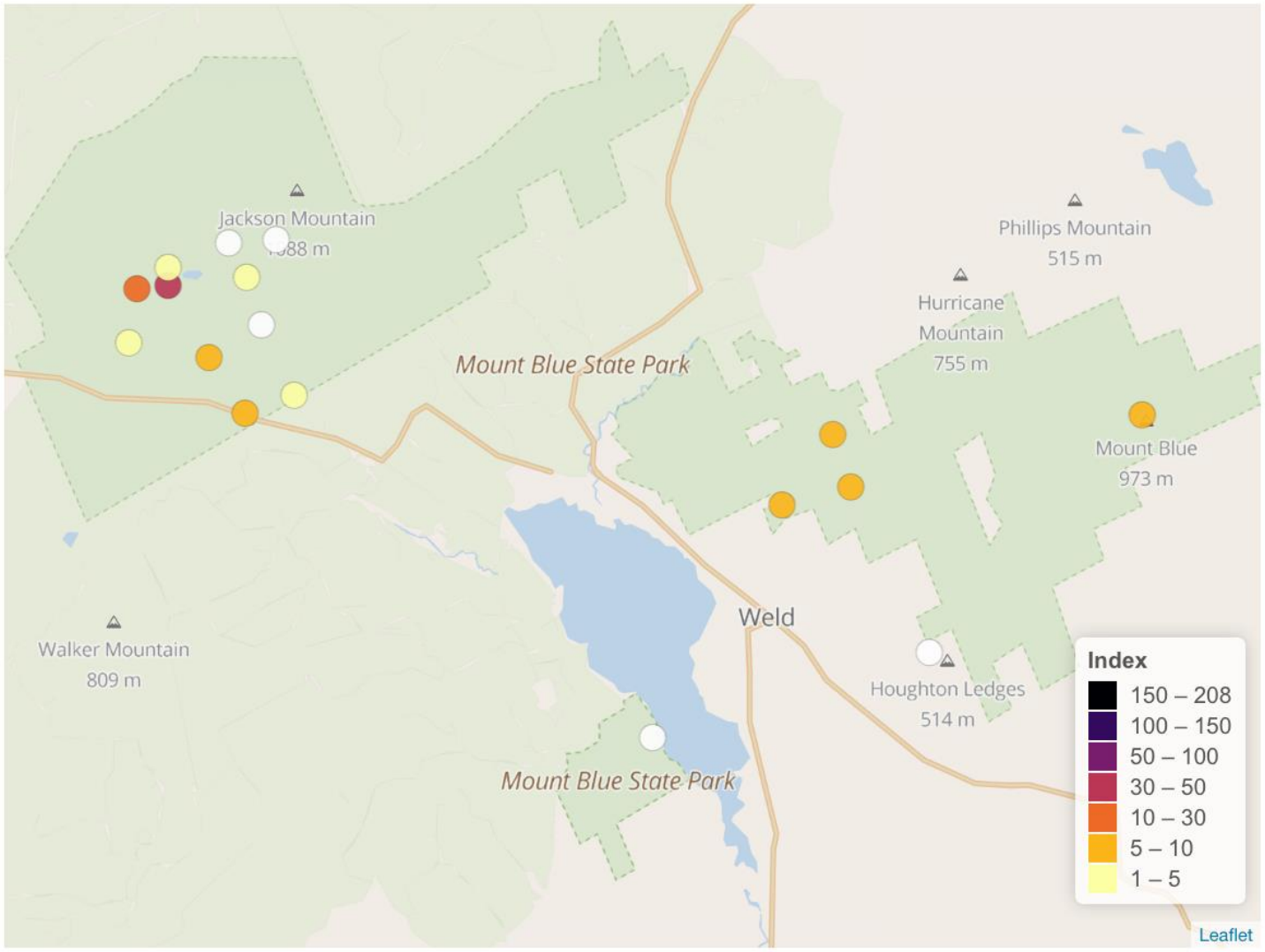
2019 Pedestrian Index



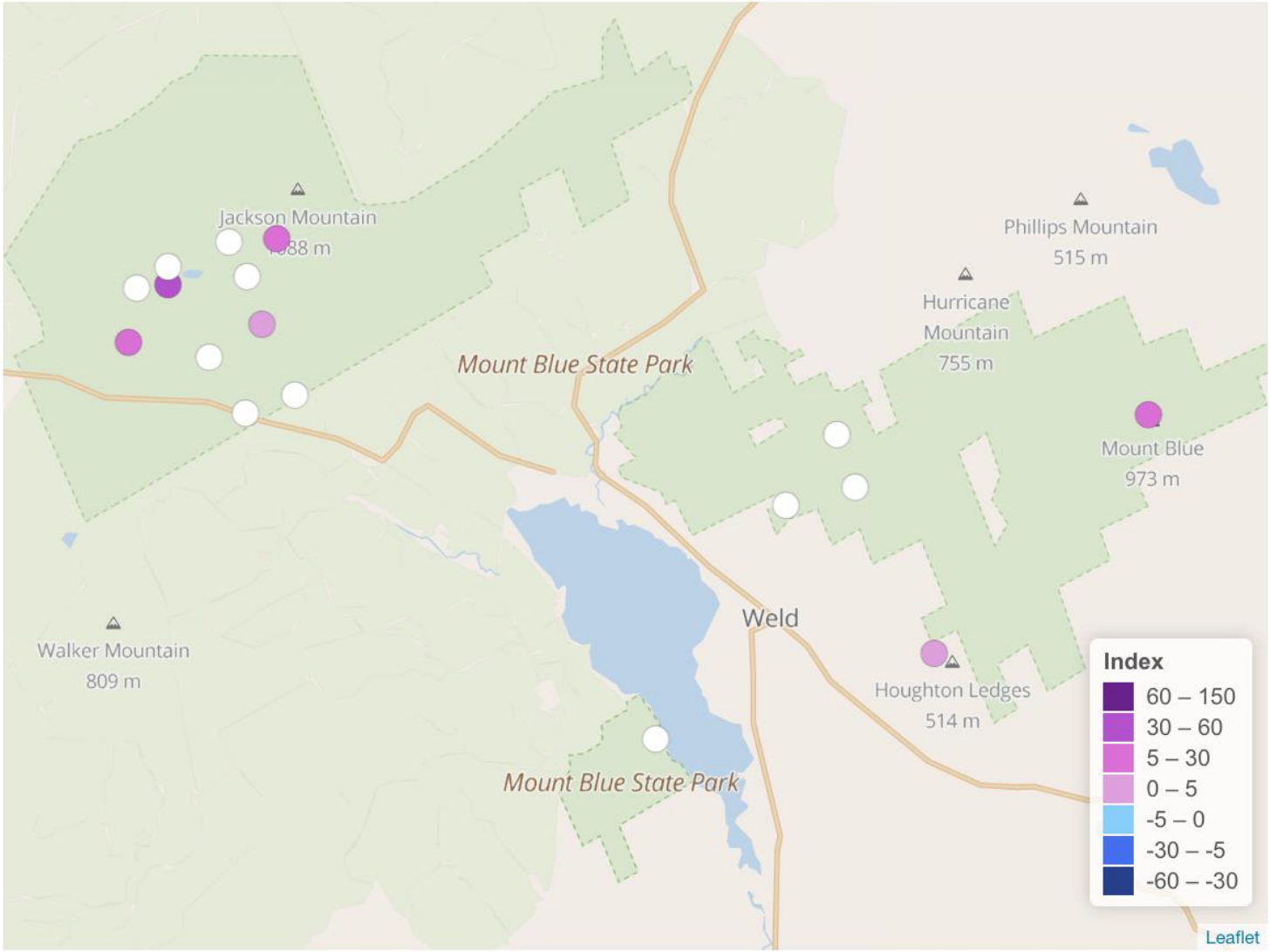
2020 Pedestrian Index



2021 Pedestrian Index



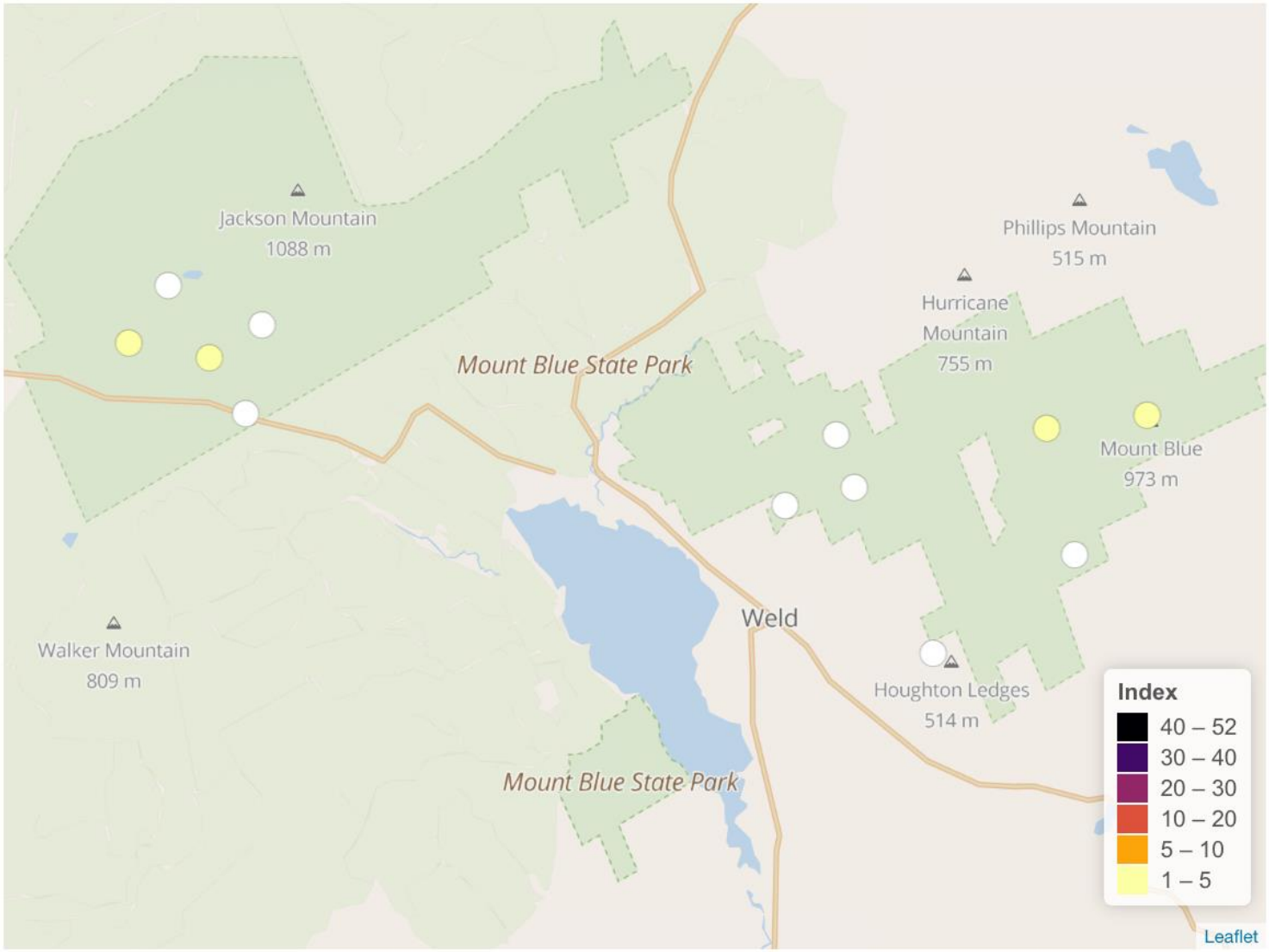
Difference in Pedestrian Index: 2020 vs 2019



Difference in Pedestrian Index: 2021 vs 2020

Difference in Pedestrian Index: 2021 vs 2019

2021 Cycling Index



Difference in Cycling Index: 2021 vs 2020

Appendix B Tabular Index Data by Count Location

81 Trails Across Maine's StreetLight Subscription Zone

			Pedestrian Index			Year Over Year Change		
Zone Name	Trail Name	Gate Location	2019	2020	2021	2019 to 2020	2020 to 2021	2019 to 2021
ANP-40	Acadia National Park	Park Loop	149	179	557	30	378	408
ANP-43	Acadia National Park	Beehive	85	124	277	39	153	192
ANP-56	Acadia National Park	Hulls Cove	34	40	153	6	113	119
AB-41	Armistice Bridge		33	128	176	95	48	143
BCT-18	Back Cove Trail	East Parking	258	289	204	31	-85	-54
BCT-17	Back Cove Trail	Turkey Bridge	217	273	144	56	-129	-73
BCT-19	Back Cove Trail	West Parking	2	1		-1		-2
BBM-42	Bauneg Beg Mountain		10	48	40	38	-8	30
BCM-44	Beth Condon Memorial Trail		140	258	337	118	79	197
BCF-63	Bethel Community Forest	Locke Mountain Road			16			16
BPW-46	Bethel Pathway	Davis Park	30	67	80	37	13	50
BPW-45	Bethel Pathway	Bridge	4	17	21	13	4	17
BVT-47	Bethel Village Trails		40	77	79	37	2	39
BBT-48	Bond Brook Trail		7	20	6	13	-14	-1
BRW-9	Brewer River Walk	North End	21	62	76	41	14	55
BRW-6	Brewer Riverwalk	South End	586	480	376	-106	-104	-210
BBWT-1	Brunswick Bike Walk Trail	Dog Park	59	149	161	90	12	102
BBWT-15	Brunswick Bike Walk Trail	Mid Trail	29	81	62	52	-19	33
CH-89	Chick Hill			17	22		5	22
CT-49	Cliff Trail		21	59	80	38	21	59
DST-25	Downeast Sunrise Trail	Ellsworth High St	2	3	11	1	8	9
DST-28	Downeast Sunrise Trail	Washington Junction			5			5
DST-22	Downeast Sunrise Trail	Cherryfield Center			13			13
ECG-16	East Coast Greenway	Whipple St	75	229	146	154	-83	71
ECG-14	East Coast Greenway	Tall Pines Drive	15	46	37	31	-9	22
ECG-2	East Coast Greenway	Blackpoint	5	33	27	28	-6	22
ECG-5	East Coast Greenway	Saco	4	10	8	6	-2	4
ECG-36	East Coast Greenway	Rotary Centennial Trail	3	2	2	-1	0	-1
ECG-35	East Coast Greenway	Parking Lot South			3			3
ECG-4	East Coast Greenway	Mill Brook		2	3		1	3
ECG-38	East Coast Greenway	Simpson Ave		2				0
EPT-30	Eastern Promenade Trail	Fish Point	755	949	1620	194	671	865

EPT-29	Eastern Promenade Trail	East End Beach	321	449	798	128	349	477
EPT-21	Eastern Promenade Trail	Boat Launch	119	179	339	60	160	220
EPT-37	Eastern Promenade Trail	Sewage Plant	74	141	207	67	66	133
ET-32	Eastern Trail	Kennebunk Elementary School	71	146	101	75	-45	30
ET-31	Eastern Trail	Emmons Rd	43	98	66	55	-32	23
ET-39	Eastern Trail	Southern Maine Health Center	12	27	41	15	14	29
ET-20	Eastern Trail	Bass Ln	3	36	14	33	-22	11
ET-33	Eastern Trail	Limerick Rd	3	18	12	15	-6	9
ET-34	Eastern Trail	Mountain Rd	1	17	15	16	-2	14
FPT-90	Fields Pond Trail		2	13	39	11	26	37
GPM-53	Great Pond Mountain		26	102	88	76	-14	62
HVNC-54	Hidden Valley Nature Center		4	15	16	11	1	12
HTST-55	Hills to Sea Trail	Rt 7		2	3		1	3
KH-57	Kennebec Highlands	Round Top	2	3	50	1	47	48
KRRT-60	Kennebec River Rail Trail	Memorial Bridge	4	11	44	7	33	40
KRRT-61	Kennebec River Rail Trail	Hannaford	1	4	2	3	-2	1
KRRT-59	Kennebec River Rail Trail	YMCA entrance	1	2		1		-1
KRRT-62	Kennebec River Rail Trail	Water Street		2				0
LIP-88	Lane Island Preserve		16	21	17	5	-4	1
MBPT-64	Mill Brook Preserve		1	51	34	50	-17	33
MWT-65	Mount Will Trail		2	19	5	17	-14	3
MDT-83	Mountain Division Trail	Windham	32	148	162	116	14	130
MDT-52	Mountain Division Trail	Gorham	57	55	182	-2	127	125
MDT-79	Mountain Division Trail	Standish	7	53	35	46	-18	28
MDT-51	Mountain Division Trail	Bike Counter location			7			7
MtP-85	Mt Pisgah	Blueberry Trail	22	63	68	41	5	46
MtP-84	Mt Pisgah	Tower Trail	18	62	64	44	2	46
MtP-66	Mt Pisgah	Tower Road	10	29	27	19	-2	17
MtA-67	Mt. Agamenticus			91	124		33	124
MtC-68	Mt. Cutler			7	5		-2	5
NBRT-69	Norway Branch Rail Trail		16	33	60	17	27	44
PMT-8	Papermill Trail	Miller Park	21	87	43	66	-44	22
PMT-7	Papermill Trail	Lisbon Community School	1	28	16	27	-12	15
PLM-70	Pleasant Mountain		10	18	10	8	-8	0
PPT-71	Powell Point Trail			11	3		-8	3
PZM-72	Puzzle Mountain	Parking Lot	1	6	3	5	-3	2
QRT-73	Quarry Road Trails	Parking Lot	2	2	12	0	10	10
RLT-74	River Link Trail	Zak Preserve		2				0

RLT-75	River Link Trail	McKay Road		3	2		-1	2
RLT-76	River Link Trail	Old Country Road			2			2
RFT-77	Roberts Farm Trails		4	17	10	13	-7	6
RB-86	Rockland Breakwater		65	187	268	122	81	203
RCT-87	Round the Cove Trail		1	2		1		-1
SM-78	Sabbatus Mountain		2	2		0		-2
SPGW-13	South Portland Greenbelt Walkway	Breakwater Drive	241	313	311	72	-2	70
SPGW-11	South Portland Greenbelt Walkway	Casco Bay Bridge West	158	219	135	61	-84	-23
SPGW-12	South Portland Greenbelt Walkway	Casco Bay Bridge East	147	157	106	10	-51	-41
SPGW-10	South Portland Greenbelt Walkway	Wainwright	25	85	17	60	-68	-8
TCB-80	Two Cent Bridge		172	305	289	133	-16	117
WSRT-82	Whistle Stop Rail Trail	Farmington	5	25	45	20	20	40
WSRT-81	Whistle Stop Rail Trail	Jay		3	5		2	5
Total			4307	7014	8644	2565	1597 4307	4337 7014

			Cycling Index			Year over Year Change		
Zone ID	**Trail Name**	**Count Location**	**2019**	**2020**	**2021**	**2019 to 2020**	**2020 to 2021**	**2019 to 2021**
AB-41	Armistice Bridge	Belfast	28	37	17	9	-20	-11
ANP-40	Acadia National Park	Park Loop	56	40	62	-16	22	6
ANP-43	Acadia National Park	Beehive	15	15	19		4	4
ANP-56	Acadia National Park	Hulls Cove	31	36	40	5	4	9
BBM-42	Bauneg Beg Mountain			1	3		2	3
BBT-48	Bond Brook Trail		1	2		1		-1
BBWT-1	Brunswick Bike Walk Trail	Dog Park	22	21	24	-1	3	2
BBWT-15	Brunswick Bike Walk Trail	Mid Trail	27	33	23	6	-10	-4
BCM-44	Beth Condon Memorial Trail		14	19	5	5	-14	-9
BCT-17	Back Cove Trail	Turkey Bridge	106	95	59	-11	-36	-47
BCT-18	Back Cove Trail	East Parking	59	52	38	-7	-14	-21
BCT-19	Back Cove Trail	West Parking	55	48	21	-7	-27	-34
BPW-45	Bethel Pathway	Bridge	9	10	11	1	1	2

BPW-46	Bethel Pathway	Davis Park	8	7	14	-1	7	6
BRW-6	Brewer Riverwalk	South End	11	18	8	7	-10	-3
BVT-47	Bethel Village Trails	Bethel	6	6	12		6	6
CH-89	Chick Hill	Clifton		1			-1	0
CT-49	Cliff Trail		1	1	2		1	1
DST-22	Downeast Sunrise Trail	Cherryfield Center	1	3	4	2	1	3
DST-23	Downeast Sunrise Trail	Cherryfield East	0	4	7	4	3	7
DST-24	Downeast Sunrise Trail	Cherryfield West	1	2	3	1	1	2
DST-25	Downeast Sunrise Trail	Ellsworth High St	2	5	56	3	51	54
DST-26	Downeast Sunrise Trail	Franklin West	2	7	2	5	-5	0
DST-27	Downeast Sunrise Trail	Little Tunk	1	3	2	2	-1	1
DST-28	Downeast Sunrise Trail	Washington Junction	2	5	2	3	-3	0
ECG-14	East Coast Greenway	Tall Pines Drive	4	2	2	-2	0	-2
ECG-16	East Coast Greenway	Whipple St	6	7	9	1	2	3
ECG-2	East Coast Greenway	Blackpoint	29	56	35	27	-21	6
ECG-3	East Coast Greenway	Goosefare		1				0
ECG-35	East Coast Greenway	Parking Lot South			0			0
ECG-36	East Coast Greenway	Rotary Centennial Trail			1			1
ECG-38	East Coast Greenway	Simpson Ave		1				0
ECG-4	East Coast Greenway	Mill Brook	37	55	38	18	-17	1
ECG-5	East Coast Greenway	Saco	15	19	21	4	2	6
EPT-21	Eastern Promenade Trail	Boat Launch	109	94	98	-15	4	-11
EPT-29	Eastern Promenade Trail	East End Beach	122	104	117	-18	13	-5
EPT-30	Eastern Promenade Trail	Fish Point	211	172	159	-39	-13	-52
EPT-37	Eastern Promenade Trail	Sewage Plant	72	88	57	16	-31	-15
ET-20	Eastern Trail	Bass Ln	18	32	18	14	-14	0
ET-31	Eastern Trail	Emmons Rd	14	26	21	12	-5	7
ET-32	Eastern Trail	Kennebunk Elementary School	9	21	15	12	-6	6
ET-33	Eastern Trail	Limerick Rd	17	32	19	15	-13	2
ET-34	Eastern Trail	Mountain Rd	18	33	19	15	-14	1
ET-39	Eastern Trail	Southern Maine Health Center	14	23	17	9	-6	3
FPT-90	Fields Pond Trail			1				0
GPM-53	Great Pond Mountain	Orland	0	1	0	1	-1	0
HVNC-54	Hidden Valley Nature Center		0		2			2
KH-57	Kennebec Highlands	Round Top Trailhead			1			1
KRRT-58	Kennebec River Rail Trail	Granite City Park	3	12	9	9	-3	6
KRRT-60	Kennebec River Rail Trail	Memorial Bridge			22			22

KRRT-61	Kennebec River Rail Trail	Hannaford _Gardiner	11	32	24	21	-8	13
KRRT-62	Kennebec River Rail Trail	Water Street Trailhead	18	45	33	27	-12	15
LIP-88	Lane Island Preserve		1	2	1	1	-1	0
MBPT-64	Mill Brook Preserve Trail			2	0		-2	0
MDT-50	Mountain Division Trail	Fryeburg			4			4
MDT-51	Mountain Division Trail	Bike Counter location			4			4
MDT-52	Mountain Division Trail	Gorham	12	3	23	-9	20	11
MDT-79	Mountain Division Trail	Standish	7	12	11	5	-1	4
MDT-83	Mountain Division Trail	Windham	6	17	24	11	7	18
MtC-68	Mt. Cutler			1	0		-1	0
MtP-66	Mt Pisgah	Tower Road	1	2	1	1	-1	0
MtP-84	Mt Pisgah	Tower Trail	2	2	1	0	-1	-1
MtP-85	Mt Pisgah	Blueberry Trail	1	1	1	0	0	0
NBRT-69	Norway Branch Rail Trail		1		0			-1
PLM-70	Pleasant Mountain		3	4	1	1	-3	-2
PMT-7	Papermill Trail	Lisbon Community School	6	14	3	8	-11	-3
PMT-8	Papermill Trail	Miller Park		0				0
PZM-72	Puzzle Mountain	Parking Lot		0				0
QRT-73	Quarry Road Trails	Parking Lot	1	23	20	22	-3	19
RB-86	Rockland Breakwater		1	2	2	1	0	1
RCT-87	Round the Cove Trail		0	1		1		0
RFT-77	Roberts Farm Trails		1	0	0	-1	0	-1
RLT-74	River Link Trail	Zak Preserve			1			1
RLT-75	River Link Trail	McKay Road	1	2		1		-1
SM-78	Sabbatus Mountain		0					0
SPGW-10	South Portland Greenbelt Walkway	Wainwright	32	104	67	72	-37	35
SPGW-11	South Portland Greenbelt Walkway	Casco Bay Bridge West	45	80	31	35	-49	-14
SPGW-12	South Portland Greenbelt Walkway	Casco Bay Bridge East	0	0		0		0
SPGW-13	South Portland Greenbelt Walkway	Breakwater Drive	95	101	70	6	-31	-25
TCB-80	Two Cent Bridge		10	10	5	0	-5	-5
WSRT-81	Whistle Stop Rail Trail	Jay	0	2	3	2	1	3
WSRT-82	Whistle Stop Rail Trail	Farmington	10	17	12	7	-5	2

State Park Trails - Index and Year over Year Change

		Pedestrian Index			Year Over Year Change		
Location ID	**Park Name**	**2019**	**2020**	**2021**	**2019 to 2020**	**2020 to 2021**	**2019 to 2021**
C-1	Camden Hills	116	157	207	41	50	91
C-10	Camden Hills	36	88	123	52	35	87
C-11	Camden Hills	31	52	110	21	58	79
C-12	Camden Hills	22	13	72	-9	59	50
C-13	Camden Hills	22	32	85	10	53	63
C-14	Camden Hills	1	17	14	16	-3	13
C-15	Camden Hills	23	34	97	11	63	74
C-16	Camden Hills	32	60	99	28	39	67
C-17	Camden Hills	48	83	185	35	102	137
C-18	Camden Hills	4	10	17	6	7	13
C-19	Camden Hills	45	72	162	27	90	117
C-2	Camden Hills	33	53	137	20	84	104
C-20	Camden Hills	30	58	78	28	20	48
C-21	Camden Hills	2	2	4	0	2	2
C-22	Camden Hills	12	26	34	14	8	22
C-23	Camden Hills	3	8	20	5	12	17
C-24	Camden Hills	12	18	33	6	15	21
C-25	Camden Hills	35	81	100	46	19	65
C-26	Camden Hills	18	57	36	39	-21	18
C-27	Camden Hills	30	83	89	53	6	59
C-28	Camden Hills	13	20	34	7	14	21
C-29	Camden Hills	12	23	43	11	20	31
C-3	Camden Hills	18	67	70	49	3	52
C-30	Camden Hills	3	7	16	4	9	13
C-31	Camden Hills	1	2	6	1	4	5
C-32	Camden Hills	2	10	6	8	-4	4
C-33	Camden Hills	1	5	4	4	-1	3
C-34	Camden Hills	1	8	2	7	-6	1
C-35	Camden Hills		6				
C-36	Camden Hills	1	3	2	2	-1	1
C-37	Camden Hills	2	9	7	7	-2	5
C-38	Camden Hills	1	2		1		
C-39	Camden Hills	1	9	2	8	-7	1
C-4	Camden Hills	25	49	47	24	-2	22
C-40	Camden Hills	2	22	10	20	-12	8

C-41	Camden Hills		7	2		-5	
C-43	Camden Hills	2	9	2	7	-7	0
C-44	Camden Hills	2	26	11	24	-15	9
C-45	Camden Hills	18	47	24	29	-23	6
C-46	Camden Hills	18	52	30	34	-22	12
C-47	Camden Hills	11	23	17	12	-6	6
C-48	Camden Hills	8	24	18	16	-6	10
C-49	Camden Hills	22	76	24	54	-52	2
C-5	Camden Hills	35	74	39	39	-35	4
C-50	Camden Hills	21	82	40	61	-42	19
C-51	Camden Hills		7	2		-5	
C-52	Camden Hills	2	7	2	5	-5	0
C-53	Camden Hills		2	2		0	
C-54	Camden Hills	39	45	69	6	24	30
C-55	Camden Hills	1	5		4		
C-56	Camden Hills	10	9	21	-1	12	11
C-57	Camden Hills		6	5		-1	
C-58	Camden Hills	1	7	2	6	-5	1
C-6	Camden Hills	27	45	84	18	39	57
C-60	Camden Hills	2	3	4	1	1	2
C-62	Camden Hills	1	6	5	5	-1	4
C-63	Camden Hills	1	4		3		
C-7	Camden Hills	11	23	79	12	56	68
C-8	Camden Hills	23	42	65	19	23	42
C-9	Camden Hills	30	86	102	56	16	72
T-1	Tumbledown	5	16	2	11	-14	-3
T-10	Tumbledown		16				
T-11	Tumbledown		12	10		-2	
T-12	Tumbledown	2		2			0
T-2	Tumbledown	24	63	30	39	-33	6
T-3	Tumbledown			5			
T-4	Tumbledown	1		3			2
T-5	Tumbledown	3	3		0		
T-6	Tumbledown		3	2		-1	
T-7	Tumbledown	1	15		14		
T-8	Tumbledown		19	5		-14	
B-12	Mount Blue	1	1		0		
B-15	Mount Blue	1	21	6	20	-15	5
B-2	Mount Blue		1				

B-4	Mount Blue			7			
B-6	Mount Blue	1		4			3
B-8	Mount Blue			5			

		Cycling Index			Year Over Year Change		
Trail ID	**Park Name**	**2019**	**2020**	**2021**	**2019 to 2020**	**2020 to 2021**	**2019 to 2021**
C-1	Camden Hills	9	15	51	6	36	42
C-10	Camden Hills	2	1	9	-1	8	7
C-11	Camden Hills			6			
C-12	Camden Hills	0	1	4	1	3	4
C-13	Camden Hills	1	11	14	10	3	13
C-14	Camden Hills	1	10	10	9	0	9
C-15	Camden Hills	0		7			7
C-16	Camden Hills		1	5		4	
C-17	Camden Hills	0	1	9	1	8	9
C-18	Camden Hills			1			
C-19	Camden Hills	2	1	10	-1	9	8
C-2	Camden Hills	1	1	11	0	10	10
C-20	Camden Hills	1	1	2	0	1	1
C-21	Camden Hills			0			
C-23	Camden Hills			1			
C-25	Camden Hills			1			
C-27	Camden Hills			0			
C-28	Camden Hills			1			
C-3	Camden Hills	1	19	28	18	9	27
C-32	Camden Hills	0	1		1		
C-33	Camden Hills	0	1		1		
C-34	Camden Hills		1	1		0	
C-35	Camden Hills		1	0		-1	
C-36	Camden Hills			0			
C-37	Camden Hills	1	10	10	9	0	9
C-39	Camden Hills	0	10	10	10	0	10
C-4	Camden Hills		19	24		5	
C-40	Camden Hills	0	9	7	9	-2	7
C-41	Camden Hills			1			

C-43	Camden Hills		1				
C-44	Camden Hills	0	9	5	9	-4	5
C-45	Camden Hills		0	3		3	
C-46	Camden Hills		0	3		3	
C-49	Camden Hills	1	10	7	9	-3	6
C-5	Camden Hills	1	1	7	0	6	6
C-50	Camden Hills	1	7	3	6	-4	2
C-55	Camden Hills	0					
C-56	Camden Hills			1			
C-58	Camden Hills		1				
C-59	Camden Hills	0					
C-6	Camden Hills	0		4			4
C-7	Camden Hills	1	1	4	0	3	3
C-8	Camden Hills	0		2			2
C-9	Camden Hills	0		6			6
T-1	Tumbledown		2	1		-1	
T-2	Tumbledown		1				
T-3	Tumbledown			1			
T-5	Tumbledown	0					
T-8	Tumbledown		1	0		-1	
B-12	Mt Blue	0					
B-13	Mt Blue			0			
B-15	Mt Blue			1			
B-16	Mt Blue			1			
B-4	Mt Blue			0			
B-6	Mt Blue		1				
B-8	Mt Blue			0			

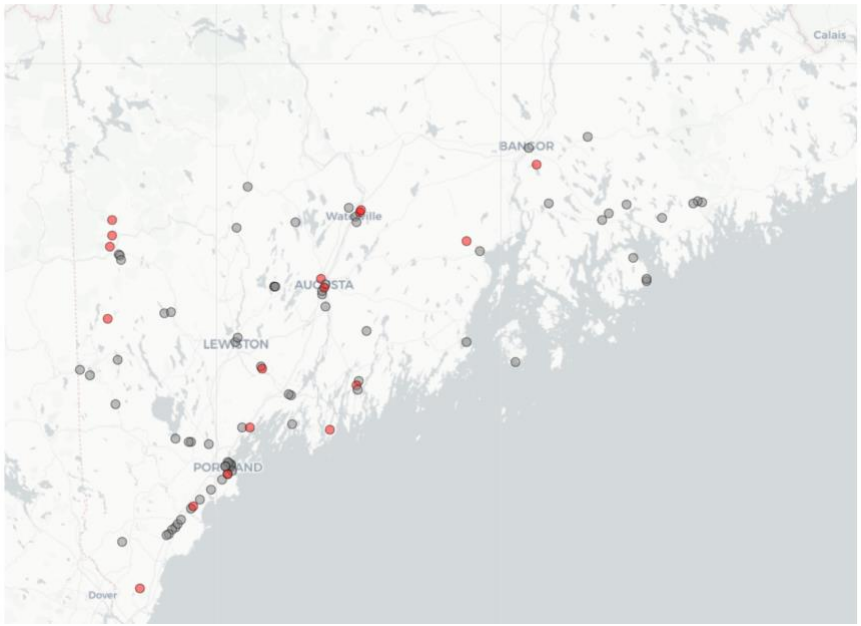
Appendix C Brief Validation of StreetLight Index Data

Locations with Missing Data

Not all zones in the StreetLight runs returned an index value. Most likely because trip counts are low, and do not meet StreetLight's threshold of 100 device counts for a zone and time period (for privacy). Maps of locations that are missing index metrics in the three years are shown below.

Pedestrian NA

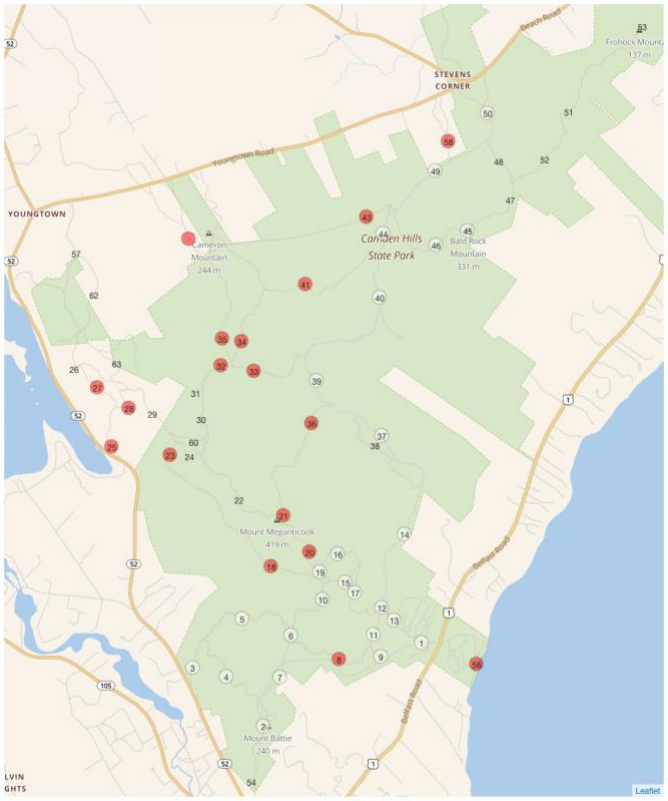
Cycling NA



Camden Hills State Park

Sites Missing Pedestrian Index

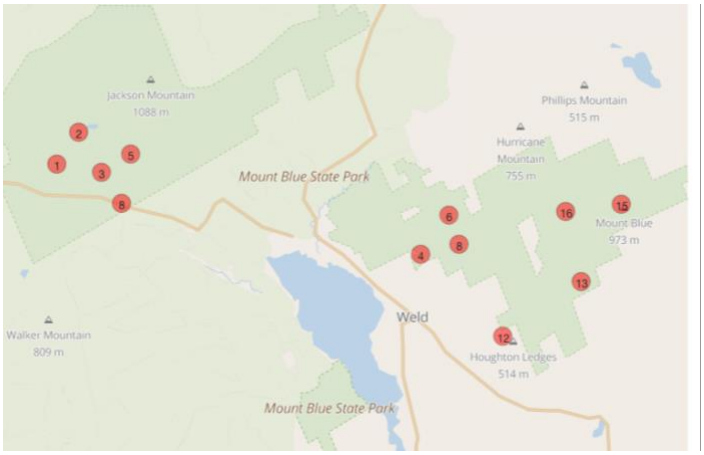
Sites Missing Cycling Index



Mount Blue State Park and Tumbledown Mountain

5 Sites Missing Pedestrian Index

12 Sites Missing Cycling Index



Comparison of StreetLight to Physical Counts

We compared the proportionality of the StreetLight pedestrian and cycling indexes compared to physical counts for the same locations. The index is linearly proportional to across locations and time periods for individual modes, therefore we would expect the ratio of the physical counts to SL index to be relatively constant, and the more it is, the more the Index accurately represents the distribution of actual trips.

Ratio = Physical Count / StreetLight Index Value

A full validation of these indexes is not within the scope of this project; however, we were able to compare the average daily trips from StreetLight indexes to temporary physical counts for six locations, taken in the summer of 2021. Physical counts were recorded using Eco-Counter Multi Mobile counters, which use infrared and tubes to count pedestrians and cyclists traveling along a trail. A source of error in this comparison comes from the fact that the StreetLight index was generated for a different time period - January to August, rather than the two-week periods during peak summer months for the physical counts.

Table 1 shows that some locations have relatively similar ratios, while others are two to three times larger. Some of these differences can be explained by the location characteristics. The site in Saco is near a school, which may have skewed the pedestrian index ratio. The ratios for Mountain Division Trail are very high compared to existing counts, which may be due to the rural location, but this should be further investigated.

Table 1. Comparison of StreetLight Insight Index Metrics and Temporary Counters

	Pedestrian			Cycling		
	Count	Index	Ratio	Count	Index	Ratio
Eastern Trail, Kennebunk @ Elementary School Connector	85	66	**1.3**	135	21	**6.4**
Eastern Trail, Arundel @ Limerick Rd.	36	12	**3.0**	134	19	**7.1**
Eastern Trail, Biddeford @ SMHC	44	41	**1.1**	59	17	**3.4**
Eastern Trail, Saco @ Thornton Academy off Clark St.	65	8	**8.2***	53	21	**2.5**
Kennebec River Trail @ Memorial Bridge	283	44	**6.4****	59	22	**2.7**
Mountain Division Trail, Fryeburg @ Western Trailhead	133	7	**19.1**	45	4	**11.3**

Appendix D Comparison of StreetLight and Park Visitor Counts

The Bureau of Parks and Lands provided annual visitor counts from state park main entrances. Since StreetLight reports on vehicle trips not the number of passengers, this is not an apples-to-apples comparison. It is also likely that the BPL data is not collected year-round, which will reduce the count compared to an annual Streetlight vehicle metric. Nevertheless, we created one-way zones corresponding to the park entrances, generated StreetLight vehicle volume (AADT), and multiplied that by 365. The percent error of StreetLight annual vehicle trips compared to the park's annual visitor count for 2018, 2019 and 2020 is include in a table below.

	2018			2019			2020		
Park Name	Count	SL Volume	Percent Error	Count	SL Volume	Percent Error	Count	SL Volume	Percent Error
Birchpoint Beach	9,800	52,195	433%	61,229	76,285	25%	8,326	48,910	487%
Bradbury Mountain	86,006	50,370	-41%	22,872	44,530	95%	99,023	77,015	-22%
Camden Hills	163,584	137,240	-16%	165,956	130,305	-21%	122,215	110,960	-9%
Crescent Beach	162,525	126,655	-22%	161,616	113,515	-30%	135,910	86,870	-36%
Damariscotta Lake	31,874	204,400	541%	23,008	187,610	715%	21,754	159,870	635%
Ferry Beach	51,452	402,595	682%	47,264	396,755	739%	47,200	378,870	703%
Kettle Cove	238,496	324,850	36%	285,489	265,355	-7%	307,641	244,915	-20%
Lake Saint George	24,218	117,165	384%	37,625	91,615	143%	15,611	88,695	468%
Lamoine	28,962	173,375	499%	25,365	151,840	499%	22,175	144,540	552%
Mackworth Island	43,978	250,755	470%	40,529	207,685	412%	45,048	208,415	363%
Moose Point	27,938	412,085	1375%	24,152	391,280	1520%	24,460	320,835	1212%
Owls Head	17,392	157,315	805%	23,032	157,680	585%	7,129	152,570	2040%
Popham Beach	187,184	106,215	-43%	186,600	91,250	-51%	162,518	94,900	-42%
Range Pond	124,015	325,945	163%	143,211	325,580	127%	165,666	294,190	78%
Scarborough Beach	77,904	48,180	-38%	79,960	59,860	-25%	98,174	68,985	-30%
Sebago Lake	223,189	70,080	-69%	206,681	74,825	-64%	231,039	78,110	-66%
Swan Lake	15,432	297,840	1830%	13,383	321,930	2306%	12,562	256,960	1946%
Two Lights	100,545	135,050	34%	114,886	147,095	28%	121,037	147,095	22%
Vaughan Woods	25,039	52,925	111%	24,522	63,510	159%	32,390	50,370	56%
Wolfes Neck Woods	70,700	28,105	-60%	80,469	41,975	-48%	119,531	38,690	-68%

The median StreetLight percent error is 103% in 2018, 136% in 2019, and 124% in 2020.

Percentile	2018	2019	2020
5th	-50%	-50%	-52%
25th	66%	39%	9%
50th	**103%**	**136%**	**124%**
75th	280%	232%	212%
95th	588%	489%	857%