Economic Value of New Hampshire's Working Landscape with a Focus on Outdoor Recreation

Calendar Year 2017

Prepared for New Hampshire Timberland Owners Association

by

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I. Executive Summary

Overall scope and size of New Hampshire's outdoor recreation economy

It was estimated that New Hampshire's forestland outdoor recreation economy generated about $1.7 billion in direct output and directly supported 17,442 jobs in 2017. Outdoor recreation participants directly spent at outdoor amusement facilities, lodging facilities, restaurants, gas stations, grocery stores, and other retail stores. The study used the same categories of outdoor recreation activities used in the U.S. Bureau of Economic Analysis (BEA). Forestland outdoor recreation activities include hunting/shooting/trapping, RVing, Alpine skiing, snowmobiling, ATVing, climbing/hiking/tent camping, equestrian, bicycling, and Nordic skiing. According to the U.S. BEA, hunting is the largest forestland recreation activity in New Hampshire by far. See Figure 1.

Total effect

The total effect of spending by forestland outdoor recreation participants is much larger. The direct output of $1.7 billion indirectly supports supply industries in the state by making purchases from them (indirect effect). Examples of these supply industries include accounting, advertising, employment services, and insurance carriers. In addition, workers in the directly and indirectly affected industries spend their earnings in the state's service industries (induced effect), such as hospitals, schools, repair and maintenance services, gas stations, restaurants, and utility companies. In 2017, the total effect of the outdoor recreation economy was estimated to be 25,745 jobs ($1.1 billion in labor income), or $3.0 billion in total (direct, indirect, and induced) output. The total effect is the sum of the direct, indirect and induced effect. See Table 1.

Total effect in perspective

The total effect of 25,745 jobs was 2.9 percent of all employment in New Hampshire in 2017. This means 2.9 percent of all employment in New Hampshire was directly or indirectly dependent on forestland outdoor recreation participant spending. The total effect of $1.8 billion in value added was 2.2 percent of the state's gross domestic product after inflation adjustment in New Hampshire during 2017.

Contribution to taxes and government receipts

The outdoor recreation economy also contributes to the state's coffer. It was estimated that outdoor recreation participant spending resulted in a total of $196 million of tax revenues to New Hampshire's state and local governments, which was about 2.1 percent of state and local government taxes and receipts (using general revenue from own sources in the U.S. Census, 2017 State & Local Government Finance). Table 4 reports detailed information on government receipts.

Outdoor recreation economy by landowner types

In total, it was estimated that private lands contribute more than public lands. The private lands have the largest total economic contribution with $2.2 billion in total output, compared to $424 million of state and municipal lands and $341 million of federal lands. This is not surprising considering that a vast majority of the state's land mass is privately owned. See Figure 2.

On a per-acre basis, private lands tend to contribute more than public lands. It was estimated that the average of $1,282 per acre in output can be attributed to private forestlands, while the average of $668 per acre can be attributed to public lands. When looking at federal lands and state/municipal lands separately, state/municipal lands are nearly as productive as private lands at $1,196 per acre, compared to $1,282 per acre of private lands. See Figure 5.

Summary

In short, the contribution of the forestland outdoor recreation economy makes to the state's economy cannot be emphasized enough. The magnitude of the outdoor recreation in the state's economy is also well documented in the national statistics. In 2012, the U.S. Census Bureau reports that, in terms of ski area revenue per resident, New Hampshire ranks as the fourth highest after Vermont, Colorado, and Utah. In addition, average spending per capita on private campsites is three times as high in New Hampshire as in the United States.

The huge economic contribution of the forestland outdoor recreation economy to the state shows how important it is to conserve and preserve the state's beautiful landscape and promote a balanced economic development strategy that will keep and maintain open space in the state. In this sense, it is critical to provide economic incentives for private landowners to keep their lands open for outdoor recreational uses and from uncoordinated real estate development.

II. Scope of the Study

The New Hampshire Timberland Owners Association (NHTOA) commissioned a new study to measure the economic value and impact of private forestland in the state, comparing this value and impact to the economic value of forestlands in public ownership. In addition to quantifying the economic activity generated by forest products management and timber harvesting, the study also quantifies the recreational economic activity the state realizes from private and public timberland.

The NHTOA has asked Daniel Lee of Plymouth State University to conduct this recreational part of the study. In measuring the size and scope of the forestland outdoor recreation economy in New Hampshire, Lee used the same definition of "outdoor recreation" as in the Outdoor Recreation Satellite Account (ORSA) by the U.S. Bureau of Economic Analysis (BEA).

The study also measured multiplier effects of outdoor recreation participant spending using IMPLAN, a standard input/output economic model. The estimated economic value was expressed in terms of employment, labor income, output, and state and local government taxes in New Hampshire.

The estimated value of the outdoor recreation economy and its economic contribution was broken down by landowner types (i.e., private, federal, and state and municipal lands). Such estimates by the landowner types were quantified in total and on a per-acre basis for comparison purposes. A challenge was that the shares of landowner types vary across outdoor recreation activities (e.g., skiing and snowmobiling). For example, while a large share of skiing in New Hampshire takes place on federal lands, no ATVing is allowed on federal lands. As a result, it was necessary to break down the economic value of the outdoor recreation economy by activity and estimate the shares of landowner types per activity.

It is worthwhile to note that the outdoor recreation economy is not the same as the tourism industry. The outdoor recreation economy counts participation by both residents and non-residents. In this sense, the outdoor recreation economy can be larger than the tourism economy. On the other hand, not all tourism is about outdoor recreation (e.g., culinary tourism, medical tourism, and so on). In this respect, the outdoor recreation economy can also be smaller than the tourism economy.

III. New Hampshire's Forestland Outdoor Recreation Economy

New Hampshire's landscape is ideal for a variety of outdoor recreation activities. A statewide inventory of recreation sites includes campgrounds (357); field sports (887); golf courses (133); historic sites (96); natural and passive recreation areas (1,110); parks, picnic areas and playgrounds (448); water access (504); and winter sports (69), according to the New Hampshire Department of Natural and Cultural Resources.[1] The importance of outdoor recreation in the state's economy is well documented in the national statistics as well. New Hampshire ranked fourth in the country in ski area revenue per resident during 2012 according to the U.S. Census Bureau.[2] In addition, direct spending per capita on private campsites is three times as high in New Hampshire as in the United States.[3] The U.S. BEA recently released state-level estimates and estimated New Hampshire's outdoor recreation economy to be $2.7 billion in value added in 2017.

[1] New Hampshire Department of Natural and Cultural Resources, "Outdoor Recreation Plan 2019-23", Table 2.3, page 56, (accessed June 19, 2019, https://www.nhstateparks.org/getmedia/cea99eb7-d642-4d98-92ab-98e3c6c567a3/9-19-FINAL-SCORP-WEBSITE.pdf).

[2] Ski area revenue per resident means total ski area revenue divided by state's population.

[3] Polecon Research, "Impacts of Campgrounds and Camping in New Hampshire", 2019, page 14.

The U.S. BEA estimate covers all outdoor recreation. However, not all outdoor recreation activities take place on or require forestlands. In quantifying economic value of forestlands, the author focused on conventional land recreation activities. Excluded are non-conventional recreation activities (e.g., amusement parks, festivals, sporting events, and concerts), and water and air activities. The Other Conventional Air and Land Activities category is also excluded because this category is reported as an aggregated sum and includes air activities. Excluding this category results in a conservative estimate of forestland outdoor recreation because it does include a few forestland recreation activities (e.g., wildlife watching/birding). Also excluded were several water activities related activities that occur in or near forestlands, such as boating/fishing and other conventional water activities (i.e. canoeing, kayaking). Again, excluding these activities results in a conservative estimate of New Hampshire's forestland outdoor recreation economy.

Per the BEA ORSA, the forestland outdoor recreation activities this report includes make up about 47.9 percent of New Hampshire's overall outdoor recreation economy. See Table 6 in Appendix D for the list of forestland recreational activities included in the study.

IV. New Hampshire's Forestland Outdoor Recreation Economy, *Total Economic Contribution*

The total contribution of the forestland outdoor recreation economy in Table 1 was estimated based on the 2017 IMPLAN model. Outdoor recreation participants directly spent at lodging facilities, restaurants, gas stations, grocery stores, and other retail stores. Their spending indirectly supported their supply industries in the state by making purchases from them (indirect effect). In addition, workers in the directly and indirectly affected industries spent their earnings in the state's service industries (induced effect). For example, Table 1 shows that the outdoor recreation economy directly created 17,442 jobs in New Hampshire. These 17,442 direct jobs supported an additional 3,190 jobs in supporting industries, such as accounting, advertising, employment services, and insurance carriers. These 17,442 direct jobs and 3,190 indirect jobs in the supporting industries together supported an additional 5,113 jobs in the service industries, such as hospitals, schools, repair and maintenance services, gas stations, restaurants and utility companies. In total, the outdoor recreation economy supported 25,745 jobs in New Hampshire in 2017.

Note that the estimates do not include the value of imported products from outside the country. This is because the estimates are based on the BEA ORSA that measures domestic gross output. In addition, the estimates measure the effect of spending by outdoor recreation participants that took place within New Hampshire, regardless of state of residency. For example, spending by John, a resident of Massachusetts who skied in New Hampshire, would show up in New Hampshire's impact, while spending by Joe, a resident of New Hampshire who went ATVing in Maine, would be included in Maine's impact, not New Hampshire's impact.

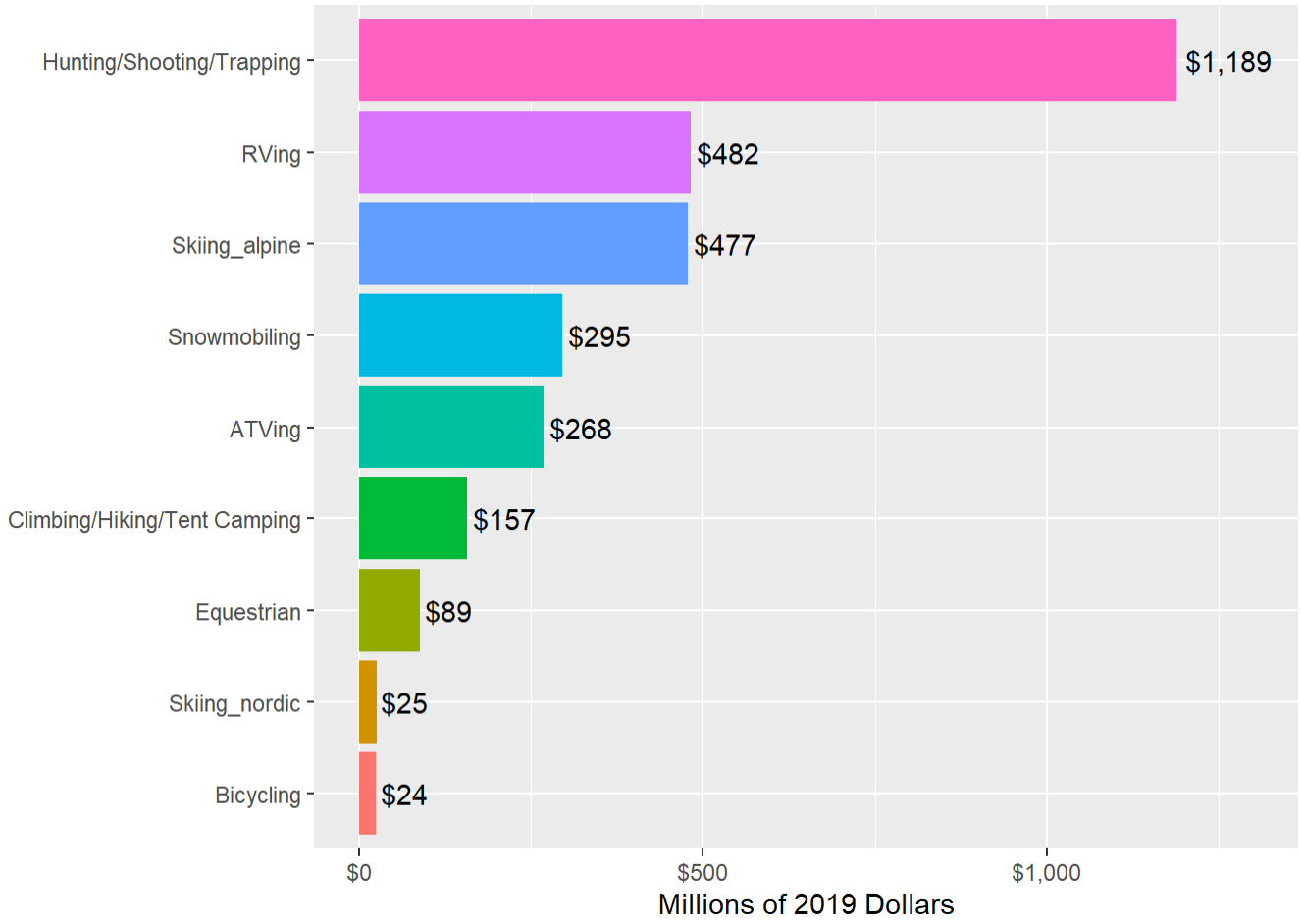
Table 1. Summary of Economic Contribution (in millions of 2019 dollars)

Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	17,442	$661	$986	$1,700
Indirect Effect	3,190	$201	$352	$576
Induced Effect	5,113	$274	$452	$730
Total Effect	25,745	$1,136	$1,790	$3,007

Note: Value added is the sum of labor income, other types of property income (such as dividends, interest income, rent income, and profits), and taxes on production and imports. Output is the sum of value added and the cost of all the inter-industry purchases required for production.

Figure 1 shows that total effect by activity in total gross output. Total gross output was distributed to activities based on each activity's share as reported in the BEA ORSA. Hunting/shooting/trapping is estimated to be the largest forestland outdoor recreation activity in New Hampshire during 2017. Its total contribution is estimated to be $1.2 billion in total gross output, which is more than twice as large as that of RVing, the second largest activity. Note that the U.S. BEA purposefully designed categories of activities to make it easier to trace expenditures on individual activities. While some closely related activities are grouped into a single category to avoid double counting, others are split into mutually exclusive categories when source data allows. The U.S. BEA explains, "For example, the category climbing/hiking/tent camping was created to avoid double-counting the many items that can be used across these activities, such as hiking boots. Likewise, a separate category was created for RVing because of the various uses for RVs outside of traditional camping."[4]

Figure 1. Output by Activity, Total Effect (of direct, indirect and induced)



[4] United States Bureau of Economic Analysis, "Outdoor Recreation Satellite Account Methodology", 2018, page 15, (accessed May 15, 2019, https://www.bea.gov/resources/methodologies/outdoor-recreation-satellite-account-methodology).

Table 2 shows the sectors (2-digit NAICS) supported by the forestland outdoor recreation economy in terms of employment. Its greatest employment contribution was to "Retail trade" with 7,058 jobs, followed by "Accommodation & food services" with 5,484.

Table 2. Sectors Affected, Employment

Description	Direct	Indirect	Induced	Total
Total	17,442	3,190	5,113	25,745
44-45 Retail trade	6,006	113	939	7,058
72 Accommodation & food services	4,823	117	544	5,484
71 Arts- entertainment & recreation	3,667	205	178	4,050
62 Health & social services	12	1	1,011	1,024
54 Professional- scientific & tech services	128	621	234	983
53 Real estate & rental	189	305	358	852
42 Wholesale Trade	469	160	143	772
56 Administrative & waste services	0	505	263	768
81 Other services	141	166	453	760
61 Educational svcs	459	24	247	730
48-49 Transportation & Warehousing	300	251	129	680
52 Finance & insurance	92	235	311	638
31-33 Manufacturing	530	44	33	606
92 Government	422	65	83	571
23 Construction	125	101	50	276
l55 Management of companies	0	155	32	187
51 Information	14	72	81	167
11 Ag, Forestry, Fish & Hunting	65	25	10	100
22 Utilities	0	18	12	30
21 Mining	0	7	1	9
93 Non NAICs	0	0	0	0

Note that Ag, Forestry, Fish & Hunting in this table is not the same as Hunting/Shooting/Trapping in Figure 1, which represents spending at all businesses on the activity (e.g., lodging, restaurants and gas station). Ag, Forestry, Fish & Hunting in this table is income only to this sector.

Table 3 shows the sectors (2-digit NAICS) supported by the forestland outdoor recreation economy in terms of labor income. Its greatest labor income contribution was to "Retail trade" with $271.5 million, followed by "Accommodation & food services" with $155.2 million.

Table 3. Sectors Affected, Labor Income (in millions of 2019 dollars)

Description	Direct	Indirect	Induced	Total
Total	$660.9	$201.3	$274.2	$1,136.4
44-45 Retail trade	$231.1	$4.3	$36.1	$271.5
72 Accommodation & food services	$136.5	$3.3	$15.4	$155.2
71 Arts- entertainment & recreation	$91.1	$5.1	$4.4	$100.7
54 Professional- scientific & tech services	$11.1	$53.7	$20.2	$85.0
42 Wholesale Trade	$47.5	$16.2	$14.5	$78.2
62 Health & social services	$0.8	$0.0	$68.1	$69.0
52 Finance & insurance	$7.9	$20.2	$26.6	$54.7
31-33 Manufacturing	$44.8	$3.7	$2.7	$51.2
92 Government	$29.0	$4.5	$5.7	$39.2
56 Administrative & waste services	$0.0	$25.4	$13.2	$38.6
81 Other services	$7.0	$8.2	$22.4	$37.6
48-49 Transportation & Warehousing	$15.9	$13.3	$6.8	$36.1
61 Educational svcs	$22.0	$1.2	$11.8	$35.0
55 Management of companies	$0.0	$16.7	$3.5	$20.2
53 Real estate & rental	$4.5	$7.2	$8.4	$20.1
23 Construction	$9.0	$7.3	$3.6	$20.0
51 Information	$1.5	$7.5	$8.4	$17.4
22 Utilities	$0.0	$2.7	$1.8	$4.5
11 Ag, Forestry, Fish & Hunting	$1.4	$0.5	$0.2	$2.1
21 Mining	$0.0	$0.2	$0.0	$0.3
93 Non NAICs	$0.0	$0.0	$0.0	$0.0

Note that Ag, Forestry, Fish & Hunting in this table is not the same as Hunting/Shooting/Trapping in Figure 1, which represents spending at all businesses on the activity (e.g., lodging, restaurants and gas station). Ag, Forestry, Fish & Hunting in this table is income only to this sector.

Table 4 shows the state and local government taxes and receipts the forestland outdoor recreation economy contributed. It collectively generated $196 million of tax revenues to New Hampshire's state and local governments from all sources (direct, indirect, and induced effect). It was about 2.1 percent of all state and local government taxes and receipts (general revenue from own sources) during 2017.

Table 4. Tax and Fee Contribution from Direct, Indirect, and Induced Economic Effect Sources (in thousands of 2019 dollars)

Source	Amount
Property Tax	$80,459
Sales Tax*	$40,879
Parks and Recreation**	$42,453
Business Tax	$13,163
OHRV Registrations	$3,913
Hunting Licenses***	$3,180
Motor Vehicle Licenses and Fees	$1,592
Personal Income Tax****	$780
Others*****	$9,297
Total	$195,716

Note:
* Sales tax largely includes rooms and meals but also gasoline tax, alcoholic beverage tax, and tobacco tax.
**Parks and recreation includes revenues generated from concession sales and operating revenues (e.g., camping, admission, pavilion/facility, and leases and special use permits).[5] Parks and Recreation is adjusted to exclude State Parks in the Seacoast Region.
***Hunting licenses sales do not include fishing licenses. Excluded are fishing, oyster, clams, rec saltwater, and fish/hunt combo.
****Personal income tax captures tax on investment income. While New Hampshire doesn't tax on wages and salaries, the state does tax on income received from interest and dividends. According to the 2017 State and Local Government Finances report, New Hampshire collected more than $65 million from individual income tax.
***** Others include business licenses, documentary and stamp taxes, rents and royalties, special assessments, fines, settlements, and donations.

[5] New Hampshire Department of Natural and Cultural Resources, Division of Parks and Recreation, "Fiscal Year 2017 Financial Report", (accessed March 16, 2020, https://www.nhstateparks.org/getmedia/d5f67894-17bf-4411-a4d5-a9b6ec4a7093/Reports-FY17-Parks-Report-FINAL-1-31-18rev022318.pdf).

V. New Hampshire's Forestland Outdoor Recreation Economy, *by Landowner Type*

Although exactly how much of an activity takes place on private lands versus public lands is unknown, the author made estimates using reasonable assumptions. See Table 7 in Appendix E for percentages of forestland owner types by activity. Three major landowner types (private, federal, and state and municipal lands) were used for all activities, except for skiing. In the case of Alpine and Nordic skiing, source data allowed a split between state and municipal lands.

Figure 2 below show total (direct, indirect, and induced) effect by owner types in terms of output. It was estimated that private lands have the largest total economic contribution with $2.2 billion output, followed by state and municipal lands with $424 million and federal lands with $341 million. The collective economic contribution of public lands was estimated to be $765 million in output, compared to $2.2 billion of private lands. This is understandable considering that almost 70 percent of New Hampshire's forestland is privately owned.

Figure 2. Output by Landowner Type, Total Effect (of direct, indirect and induced)

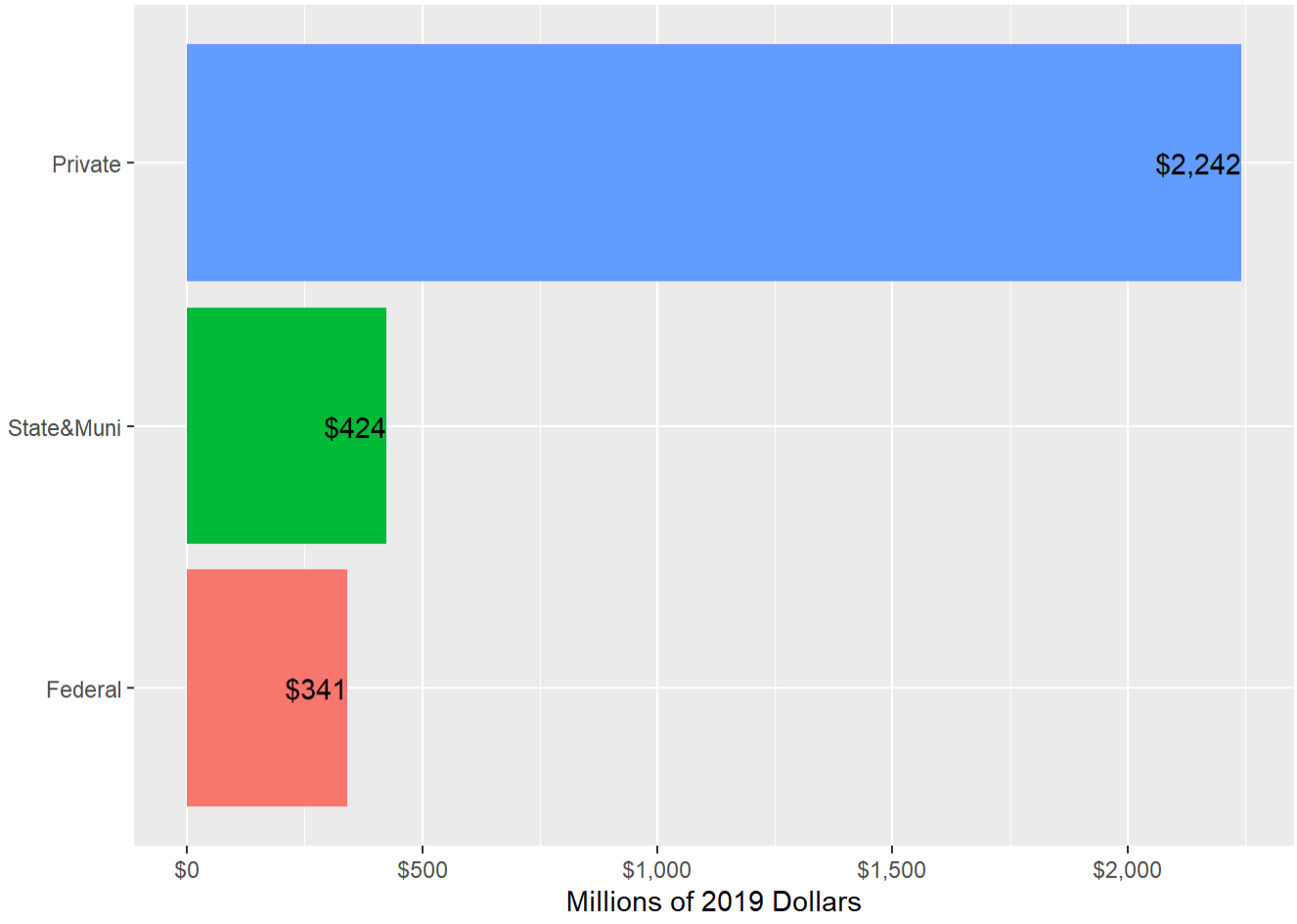
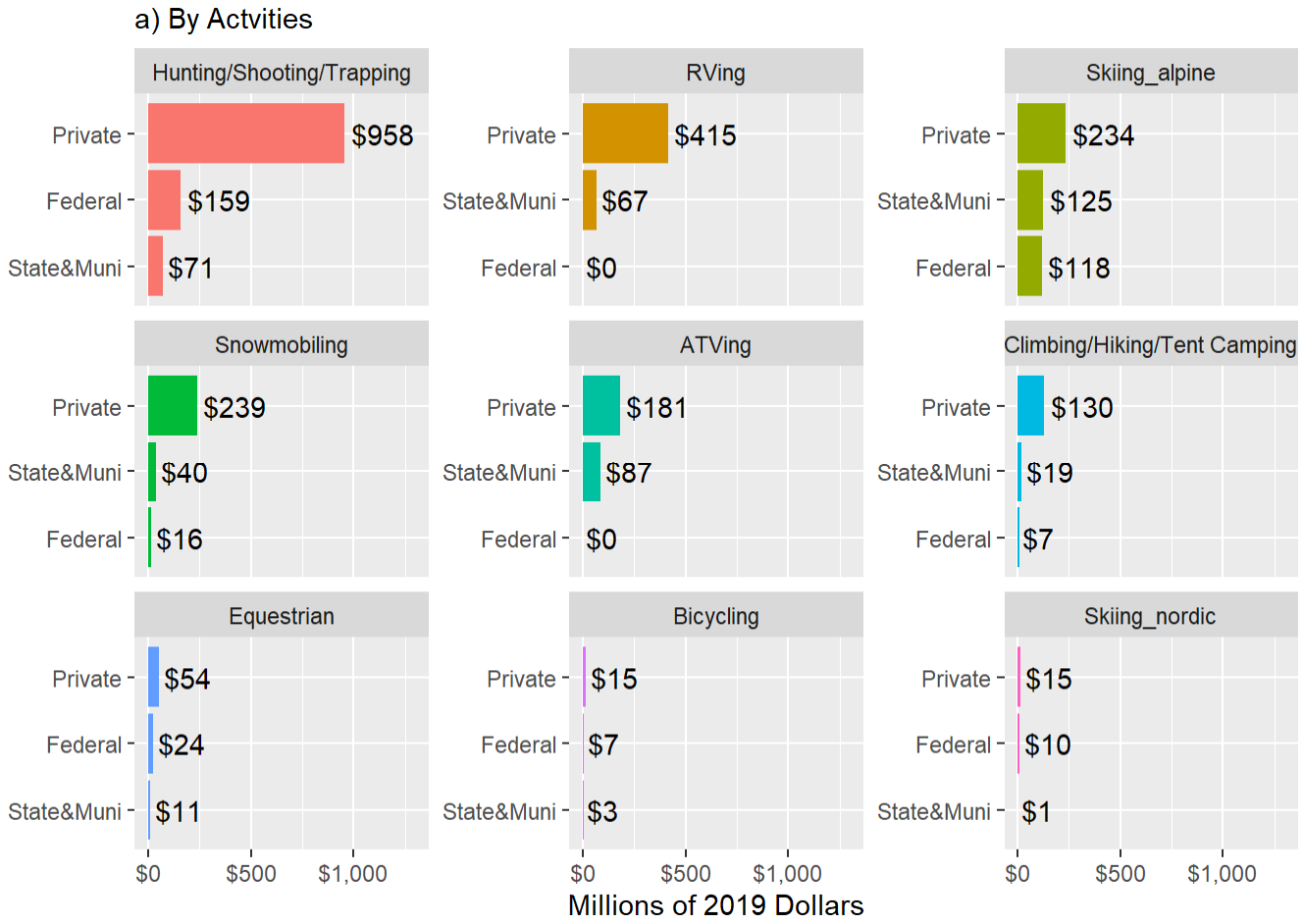


Figure 3 displays output by activity by owner types. Private lands invariably make the largest contribution across all activities. Hunting is by far the largest activity in New Hampshire, followed by RVing. Private lands contribute nearly $1 billion through hunting alone. The activity state and municipal lands make the largest contribution to is Alpine skiing ($125 million), followed by ATVing ($87 million), and Hunting ($71 million). The activity federal lands make the largest contribution to is Hunting ($159) followed by Alpine skiing ($118).

Figure 3. Output by Landowner Type by Activity, Total Effect (of direct, indirect and induced)



b) By Owner Types

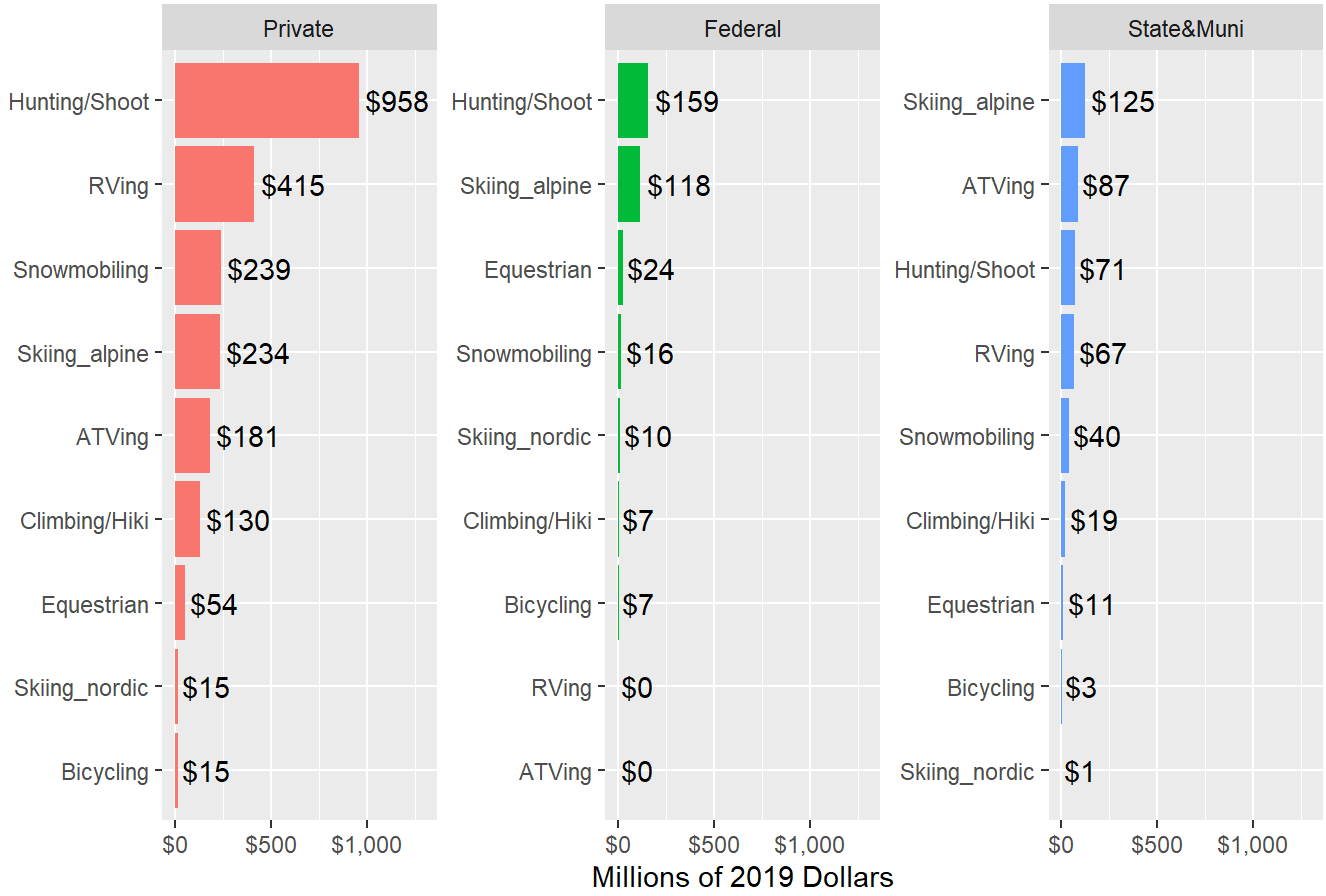


Figure 4. Output by Landowner Type for Skiing, Total Effect (of direct, indirect and induced)

Table 5. New Hampshire Forestland Acreage by Owner Type

Landowner Type	Acreage	Percent
Private	1,748,655	60.4%
Federal	791,066	27.3%
State	236,206	8.2%
Municipal	118,694	4.1%
Total	2,894,621	100.0%

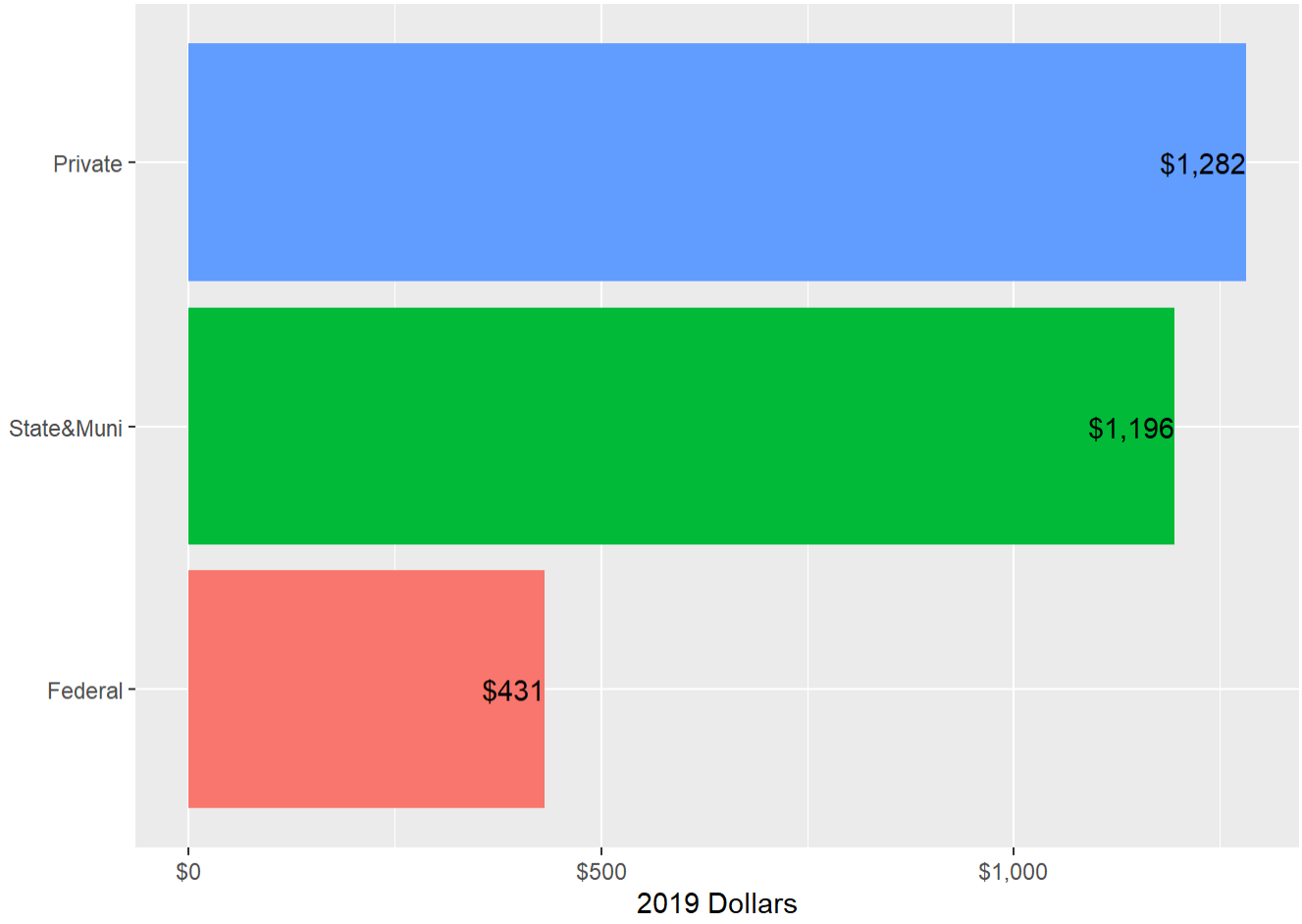
Data source: Raw data on public and private forestland area in New Hampshire were obtained from both the USDA Forest Service Forest Inventory and Analysis and through GRANIT, NH's Geographic Information System. For county and town owned land, GRANIT acreage figures were used. Current Use acreage came directly from tables published by town by the NH Dept. of Revenue Administration.

The average economic effect per acre is defined as total effect (Row of Total Effect in Table 1) divided by forestland acreage (see acreage column in Table 5). Table 5 displays forestland acreages by owner type. The estimate of 1.7 million acres of private forestlands represents only 68 percent of Current Use forestland in New Hampshire (approximately 2.57 million acres) and doesn't include non-CU private forestland. This is a conservative estimate of private forestland available for public recreation because it only includes properties greater than 10 contiguous acres (properties less than 10 contiguous acres do not qualify for Current Use). And, because the private landowner acreage only includes the 68 percent of the state's Current Use landowners who

reported that they do not post against any recreational uses,[6] Table 5 will not include properties that only post against a specific recreational use (i.e. a private landowner that only posts against hunting but permits other forms of recreation such as hiking or Nordic skiing). Note, because property taxes for almost all private forestland subject to a conservation easement are assessed through the Current Use program, the private forestland acreage in Table 5 includes private lands subject to conservation easements.

Figure 5 displays the average economic contribution per acre by landowner type. The largest contributor (on a per acre rate) is private lands ($1,282 per acre). State/Municipal lands come close at $1,196 per acre followed by federal lands at $431 per acre.

Figure 5. Output per Acre by Landowner Type, Total Effect (of direct, indirect and induced)

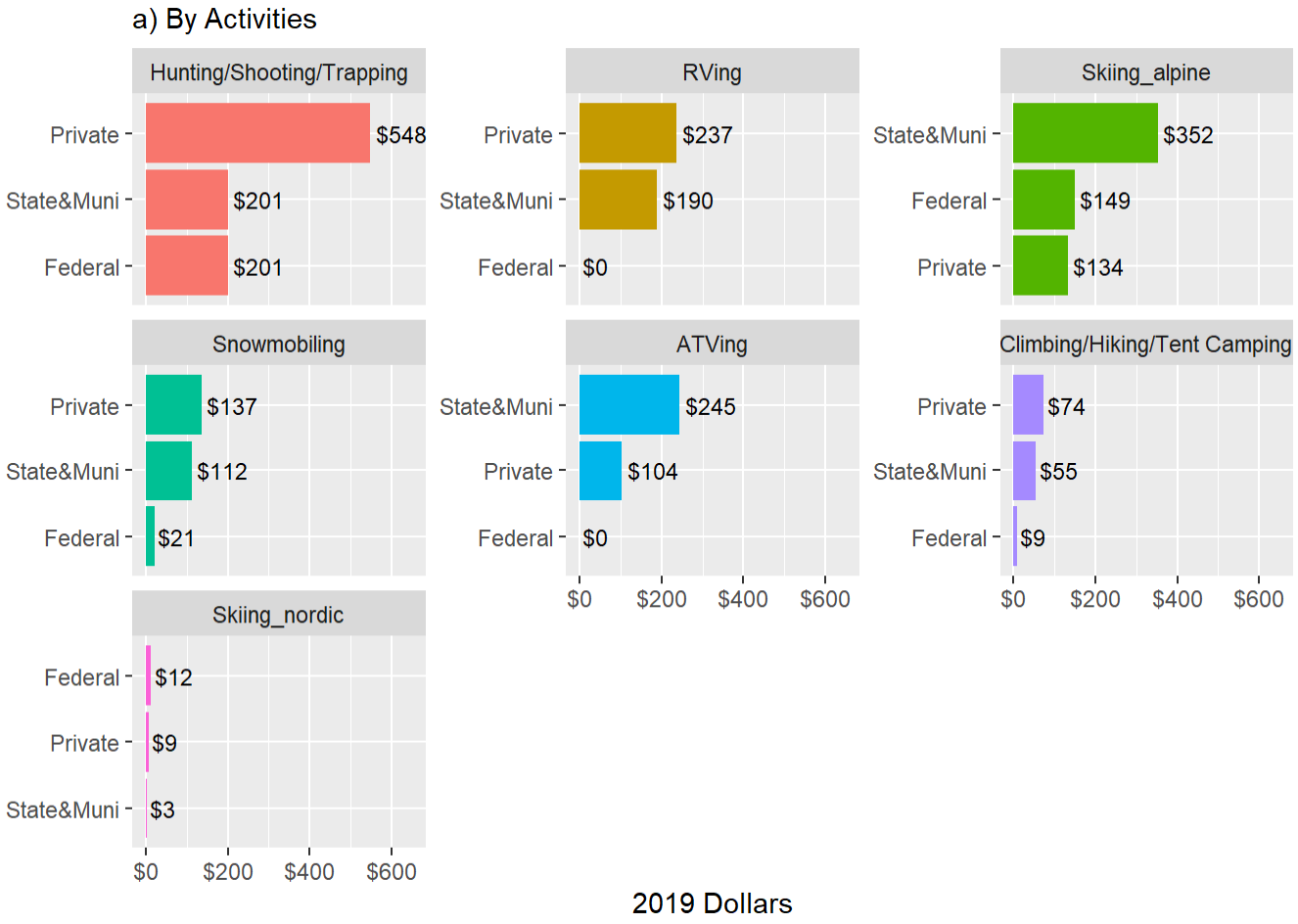


Note: Output per acre is defined as total effect (Row of Total Effect in Table 1) divided by forestland acreage (see acreage column in Table 5). The private forestland acreage used in this calculation represents 68 percent of Current Use forestland in New Hampshire and doesn't include non-CU private forestland. Refer to Table 5 for forestland acreages by owner type.

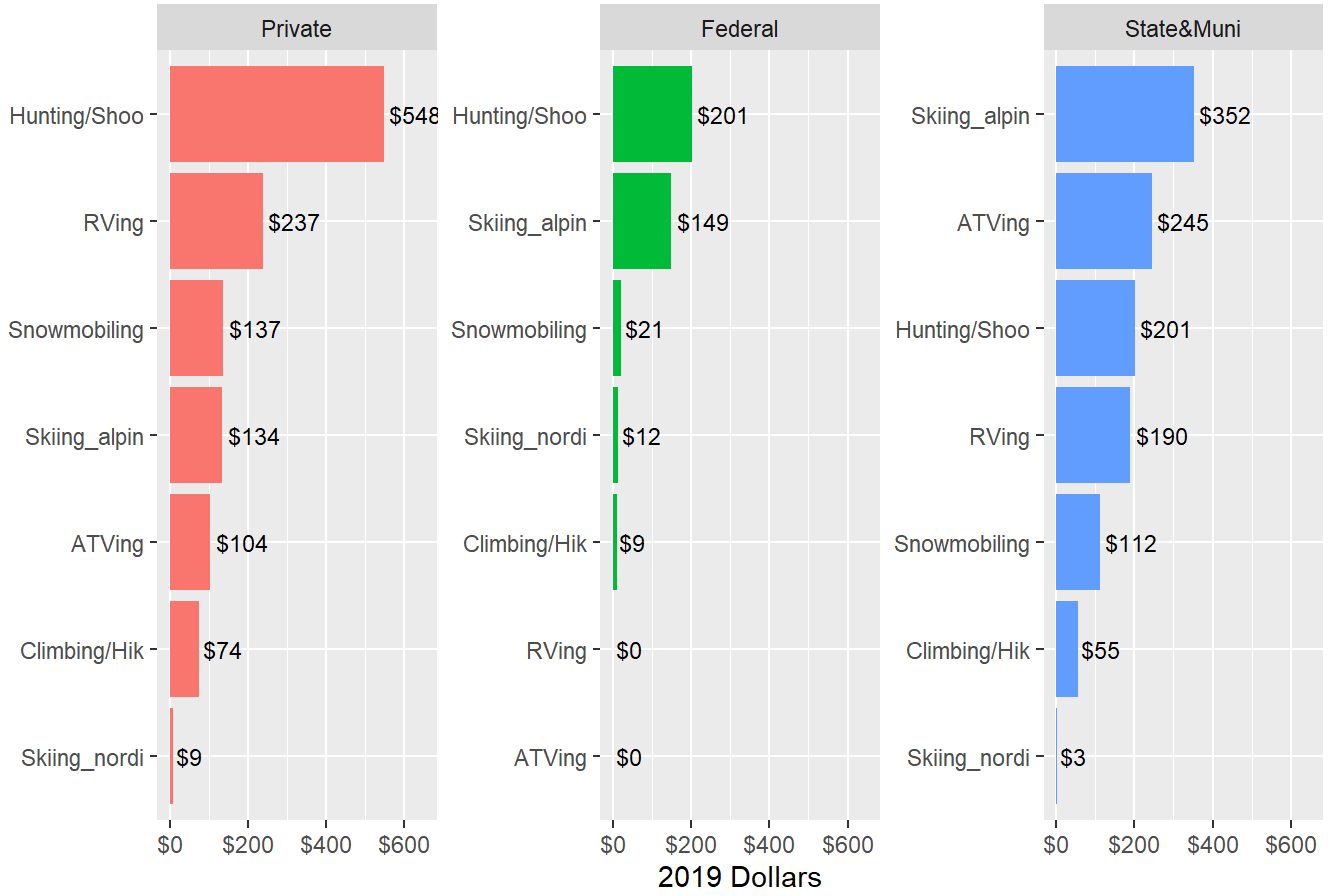
[6] SPACE: New Hampshire's Current Use Coalition, "2007 Survey of Current Use Practices in New Hampshire", 2007.

Figure 6 displays the economic output per acre by activity and owner type. On a per-acre basis, private land's top 3 activities ranked by economic output are: hunting ($548 per acre), RVing ($237 per acre), and snowmobiling ($137 per acre). State and municipal lands supported the most economic activity within 3 activities : Alpine skiing ($352 per acre), ATVing ($245 per acre), and hunting ($201 per acre). Federal land has a strong presence in skiing. Federal land was the largest economic contributor for Nordic skiing ($12 per acre) and the second for Alpine skiing ($149 per acre). Bicycling and equestrian are not included because there is no forestland owner information specific to these activities and their economic values were distributed to owner types based on forestland acreages. Thus, the average per acre would be the same amongst all owner types.

Figure 6. Output per Acre by Landowner Type by Activity, Total Effect (of direct, indirect and induced)



b) By Owner Types



VI. Appendix

A. Definitions of Key Measures

1. **Employment:** the annual average number of jobs, including both full- and part-time jobs; for example, 10 jobs for the first half of the year and 20 jobs in the second half results in 15 average jobs for the year.
2. **Labor income:** employee compensation (wages and salaries plus other compensations) and proprietor income.
3. **Value added:** labor income, other types of property income (such as dividends, interest income, rent income, and profits), taxes on production and imports.
4. **Output:** the total value of production, which is the sum of value added and the cost of all the inter-industry purchases required for production.
5. **Multiplier effect:** the cumulative economic activity arising from the fact that the forestland outdoor recreation industry's contribution spreads across the state's economy by creating and supporting jobs, incomes, and taxes. The forestland outdoor recreation industry supports its supply industries in the region by making purchases from them (indirect effect). These supply industries include marketing, accounting, employment services, and insurance carriers. In addition, workers in the forestland outdoor recreation industry and its supply industries spend their earnings in the region's services industries (induced effect), such as hospitals, schools, repair and maintenance services, and utility companies.
6. **Direct effect:** jobs, incomes, and taxes directly created by the forestland outdoor recreation industry (e.g., lodging facilities, restaurants, gas stations, grocery stores, and other retail stores).
7. **Indirect effect:** the economic effects of local inter-industry spending due to the existence of the forestland outdoor recreation industry.
8. **Induced effect:** the economic effects of local spending (usually in services industries) of employee's wages and salaries of the directly and indirectly affected industries.

B. IMPLAN Model and Data

The model used in this analysis was built by customizing the Impact Analysis for Planning (IMPLAN) regional input-output software. The first input-output model was developed by Dr. Wassily Leontieff to help the United States mobilize to meet the demand of World War II. For his work on input-output models, he won the Nobel Prize in Economic Science in 1973.

The input-output model was later applied to regional economies. With the enactment of the National Forest Management Act in 1976, the U.S. National Forest Services needed a systematic tool for evaluating the national forest management plans on local residents and businesses. Hence, the creation of the IMPLAN. The advancement of computer technologies made it possible to extrapolate, extend, and convert existing data to regional economies using non-survey methods, without the cost of onsite data collection.

Today, IMPLAN is widely used for evaluating economic impacts beyond the forest and logging sector. It traces impacts through direct, indirect, and induced economic effects. Direct effect is the initial expenditures, or production, made by the industry experiencing the economic change; indirect effect represents the effects of local inter-industry spending through the backward linkages; and induced effect is the result of local spending of employee's wages and salaries for both employees of the directly affected industry and employees of the indirectly affected industries. "Backward linkages" are the tracking of industry purchases backwards through the supply chain to the direct effect industry.

IMPLAN data is constructed primarily from federal government data, including:

- U.S. Bureau of Economic Analysis Benchmark I/O Accounts of the U.S.
- U.S. Bureau of Economic Analysis Output estimates
- U.S. Bureau of Economic Analysis REIS Program
- U.S. Bureau of Labor Statistics Covered Employment and Wages Program
- U.S. Bureau of Labor Statistics Consumer Expenditure Survey
- U.S. Census Bureau County Business Patterns program
- U.S. Census Bureau Decennial Census and Population Surveys
- U.S. Census Bureau Economic Censuses and Surveys
- U.S. Department of Agriculture Crop and Livestock Statistics
- U.S. Geological Survey

C. IMPLAN Model Assumptions

All usual assumptions of the input-output model apply in this study. The model incorporates the following:

- Constant returns to scale
  - As all inputs increase by a factor, output increases by the same factor. For example, output doubles if all inputs double.
- National production coefficients and margins
  - An industry is assumed to have identical production functions and margins in all regions in the country.
- No substitution among inputs
  - No substitution among inputs is assumed for simplicity. In practice, firms may look for an alternative for an input that becomes increasingly more expensive, which may happen if its demand increases and/or its supply falls.
- No constraints to the supply of commodity

D. Methods Estimating Forestland Outdoor Recreation Economy

The U.S. BEA estimated that New Hampshire's outdoor recreation economy by individual activity. For the purpose of this study, the author focused on conventional land recreation activities. Excluded are non-conventional recreation activities (e.g., amusement parks, festivals, sporting events, and concerts), and water and air activities. See Table 6 below. The Other Conventional Air and Land Activities category is also excluded because this category was reported as an aggregated sum and include air activities. Note that excluding this category would result in a conservative estimate of reported forestland economic activity because it includes a few forestland recreation activities (e.g., wildlife watching/birding).

The BEA estimates were revised downward for the RVing and biking activities, which take place on both non-forest lands and forestlands. One could bike on beach shores for recreation and go to New Hampshire Motor Speedway with an RV. The author estimated and excluded the non-forest portion of the activities, using shares of counties in RVing park employment[7] and bicycle sales by bicycle categories[8]. Subtracted from RVing were Merrimack, Rockingham, and Strafford Counties. Rockingham and Strafford Counties are not appropriate, as they are in the seacoast area. Merrimack County was excluded to account for the RV park at New Hampshire

[7] U.S. Census County Business Patterns 2018, NAICS 7212: RV (recreational vehicle) parks and recreational camps, (accessed December 3, 2020, https://data.census.gov/cedsci/)

[8] United States; NPD Group 2017, "Bicycle sales in the United States by category of bike in 2017", (accessed December 21, 2020, Statista 2020 through Plymouth State University Lamson Library)

Motor Speedway. It should result in a conservative impact estimate of the forestlands since not all RVing activity in the county is due to New Hampshire Motor Speedway. On the same line of reasoning, the author adjusted the BEA's estimate of the biking activity. Removed are non-mountain bike sales under the assumption that the share of mountain bikes in total bike sales is proportional to the share of forestlands in all biking. Counting all mountain-bike sales may overestimate the economic impact of forestlands. One may ride mountain bikes on not only forestlands but also non-forest lands. Counting only mountain bikes could also underestimate the impact of forestlands. Cycling the White Mountains is a popular outdoor recreation activity. When all is accounted for, taking the share of mountain bikes in all bike sales may be a reasonable way to estimate the forest portion of biking. Note that non-outdoor recreational activities such as commuting with bike are not included in the BEA estimates.

According to the U.S. BEA ORSA, these forestland outdoor recreation activities make up 46.1 percent of New Hampshire's overall outdoor recreation in value added. Therefore, 46.1 percent of employment by sector was entered into IMPLAN to estimate total economic contribution of the forestland outdoor recreation in New Hampshire. It assumes that forestland outdoor recreation uses the same ratios of inputs as in the overall outdoor recreation.

Table 6. List of BEA's Outdoor Recreation Activities *Included and Excluded* from the Study

Included	Excluded
Bicycling	Boating/Fishing
Climbing/Hiking/Tent Camping	Recreational Flying
Equestrian	Other Conventional Water Activities
Hunting/Shooting/Trapping	Other Conventional Air and Land Activities*
ATVing	Other Outdoor Recreation*
RVing	
Skiing/Snowboarding	
Snowmobiling	

Notes: Other Outdoor Recreation includes amusement parks/water parks, festivals/sporting events/concerts, field sports, game areas (includes golfing and tennis), guided tours/outfitted travel, productive activities (includes gardening), and other outdoor recreation activities. Other Conventional Air and Land Activities consist of air sports, driving for pleasure, geocaching/orienteering/rock hounding, ice skating, inline skating, land/sand sailing, races, running/walking/jogging, skateboarding, and wildlife watching/birding.

Note that the author changed the name for two activities. Snowmobiling in Table 6 appears as Other Snow Activities (includes Snowmobiling) in the BEA ORSA. The underlying assumption is that snowmobiling largely makes up the other snow activities category in New Hampshire. This assumption seems reasonable per the 2012 Plymouth State University's snowmobile study. It reported that spending by snowmobilers directly created 2,394 jobs in New Hampshire during the 2010/11 season.[9] The U.S. BEA estimated that New Hampshire's forestland outdoor recreation economy created 18,131 jobs during 2017 and the other snow activities category makes up 9.5 percent of forestland outdoor recreation in value added, which is close to the PSU's estimate of 2,394 jobs for snowmobiling.

Similarly, ATVing in Table 6 appears as Motorcycling/ATVing in the BEA ORSA. Although New Hampshire's motorcycling week in June is popular and well known, the estimated economic value for the Motorcycling/ATVing category is comparable to the economic value of ATVing alone, per the 2004 Plymouth State University's OHRV study.[10] The PSU estimated that ATV and trail biking traveler spending directly created 1,995 jobs. The forestland outdoor

[9] Plymouth State University, "The Economic Impact of Spending by Snowmobilers on New Hampshire's Economy", 2012.
[10] Plymouth State University, "The Impact of Spending by ATV/Trailbike Travel Parties on New Hampshire's Economy during July 2002 to June 2003", 2004.

recreation economy is estimated to have created 18,131 jobs during 2017 and the Motorcycling/ATVing category 8.6 percent of forestland outdoor recreation in value added, which is close to the PSU's estimate of 1,995 jobs for ATV/Trail biking.

E. Methods Estimating Forestland Outdoor Recreation by Landowner Type

Although exactly how much of an activity takes place on private lands versus public lands is unknown, the author made estimates using reasonable assumptions. Table 7 reports percentages of landowner types by activity. The information came from multitude of sources, including personal interviews with experts on the field (i.e., state government agencies, the White Mountain National Forest, and the trade associations), a variety of past surveys and studies on New Hampshire's outdoor recreation (i.e., ski area surveys), and federal and state government publications (the national surveys by the U.S. Fish and Wildlife Service). Three major landowner types (private, federal, and state and municipal lands) were used for all activities, except for skiing. In the case of Alpine and Nordic skiing, source data allowed a split between state and municipal lands.

Detailed discussions on individual activities are provided later in this section.

Table 7. Shares of Landowner Types by Activity

Owner Type	Hunting/Shooting/ Trapping	Rving	Skiing, Alpine	Snowmobiling	ATV/Trail biking	Climbing/ Hiking/Tent Camping	Skiing, Nordic
Private	80.6%	86.0%	49.1%	81.1%	67.6%	83.0%	58.7%
Federal	13.4%	0.0%	24.7%	5.5%	0.0%	4.6%	37.5%
State*	6.0%	14.0%	17.8%	13.4%	32.4%	12.4%	0.0%
Municipal			8.4%				3.8%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Note: Owner type "State" represents both state and municipal lands for all activities other than skiing.

Skiing

According to the 2019 study by Plymouth State University, Alpine (including tubing) skiers spent more than $271 million during the 2016/17 season, and Nordic skiers spent $15 million.[11] These spending estimates were apportioned to 29 ski areas that were included in the study based on their share of visitor counts. Then, the ski-area-level spending was broken into private, federal, state and municipal land according to the ski area's trail miles on private, federal, and state land. The trail miles by landowner type was obtained from the 29 ski areas and the White Mountain National Forest.[12] Note that the information in Table 8 was constructed based on these 29 major ski areas in New Hampshire. This data does not include skier expenditures for skiing on trails outside developed ski areas (i.e. backcountry Alpine skiing, and Nordic skiing on snowmobile trails).

The underlying assumption here is that skier spending is proportional to the length of trails. Let us take a hypothetical example. Suppose that New Hampshire had only two ski areas, ski areas A and B, and that Nordic skiers who visited ski area A collectively spent $1 million and Nordic skiers who visited ski area B spent $100,000. Further, assume that Ski Area A had 90% of the Nordic trails on federal land and the rest, 10%, on

[11] Plymouth State University, "Economic Contribution of the Ski Industry in New Hampshire: The Past Four Seasons 2014/15, 2015/16, 2016/17 and 2017/18", forthcoming.
[12] Personal communication with Justin Preisendorfer, White Mountain National Forest, May 28, 2019.

private, while Ski Area B had all its trails on private land. In such a hypothetical scenario, $900,000 (90% of $1 million) of the skier spending at Ski Area A would be apportioned to federal land and only $100,000 (10% of $1 million) to the private land. On the other hand, all $100,000 (100% of $100,000) of skier spending at Ski Area B would be apportioned to private land.

Table 8 Skier Spending at and away from Ski Areas in 2016/17 Season by Landowner Type (in thousands of 2016 dollars)

	Alpine		Nordic	
Landowner Type	Spending	Percent	Spending	Percent
Private	$133,242	49.1%	$8,806	58.7%
Federal	$66,950	24.7%	$5,630	37.5%
State	$48,407	17.8%	$0	0.0%
Municipal	$22,756	8.4%	$568	3.8%
Total	$271,355	100.0%	$15,004	100.0%

Snowmobiling

Snowmobiler spending by landowner type was estimated based on the snowmobile trail miles by landowner type. This data was obtained from the New Hampshire Bureau of Trails.[13] It assumes that spending is proportional to the length of trails. In a hypothetical year with $100 million of participant spending, snowmobilers would spend $76.7 million on private lands, $6.8 million on federal lands, $16.5 million on state and municipal lands.

The estimate of 5,139 trail miles on private lands represents 88.6 percent of total trail miles of 5,800 on private lands. This reflects the survey that 11.4 percent of Current Use landowners reported that they post their lands against the snowmobiling activity (No motorized vehicle / wheeled vehicles, No trespassing, and No snowmobiles).[14] This should be a conservative estimate for the private lands' economic value, as survey respondents were allowed to check multiple choices. The true posting rate for the snowmobiling activity is likely lower than 11.4 percent.

Table 9 Snowmobile Trail Miles by Landowner Type

Landowner Type	Trail Miles	Percent
Private	5,139	81.1%
Federal	350	5.5%
State/Municipal	850	13.4%
Total	7,000	100.0%

Note: These figures are not exact and based on an 'assumption' by the New Hampshire Bureau of Trails.[15]

ATVing

Spending on ATVing by landowner type was estimated based on the OHRV trail miles by landowner type. This data was obtained from the New Hampshire Bureau of Trails. It assumes that spending is proportional to the

[13] Personal communication with Christopher Gamache, New Hampshire Bureau of Trails, May 29, 2019.
[14] SPACE: New Hampshire's Current Use Coalition, "2007 Survey of Current Use Practices in New Hampshire", 2007.
[15] Personal communication with Christopher Gamache, New Hampshire Bureau of Trails, May 29, 2019.

length of trails. In a hypothetical year with $100 million of participant spending, ATV/trail bikers would spend $62.3 million on private land, none on federal land, $37.7 million on state and on municipal land.

Table 10 OHRV Trail Miles by Landowner Type

Landowner Type	Trail Miles	Percent
Private	731	67.6%
Federal	0	0.0%
State/ Municipal	350	32.4%
Total	1,081	100.0%

Note: These figures are not exact and based on an 'assumption' by the New Hampshire Bureau of Trails.[16]

The estimate of 731 trail miles on private lands represents 86 percent of total trail miles of 850 on private lands. This reflects the survey that 14 percent of Current Use landowners reported that they post their lands against the ATVing activity (No motorized vehicle / wheeled vehicles, No trespassing, and No ATV's / 4-wheelers / dirt bikes). This should be a conservative estimate for the private lands' economic value, as survey respondents were allowed to check multiple choices. The true posting rate for the ATVing activity is likely lower than 14 percent.

Hunting/Shooting/Trapping

Hunter spending by landowner type was estimated based on the estimated percentages of days of hunting by landowner type. The U.S. Fish and Wildlife Service estimated days of hunting on private and public lands that took place in New Hampshire in 2011: 1,069 days on private land and 257 days on public land.[17] The 257 days of hunting that took place on public land was distributed to federal, and state and municipal lands based on forestland acreage by owner types in Table 8.

It assumes that spending is proportional to hunting days when estimating the split in total spending between private and public land. It further assumes that spending is proportional to the forestland acreage when estimating the split in spending among public lands. In a hypothetical year with $100 million of hunter spending, $80.6 million would be estimated to occur on private land, $13.4 million on federal land, $6.0 million on state and municipal land.

Table 11 Days of Hunting by Landowner Type

Landowner Type	Days	Percent
Private	1,069	80.6%
Federal	177	13.4%
State/ Municipal	80	6.0%
Total	1,326	100.0%

Climbing/Hiking/Tent Camping

Camper spending on trip by landowner type was estimated based on the number of campsites on private lands, the White Mountain National Forest, and state parks. It assumes that spending is proportional to campsites. The

[16] Personal communication with Christopher Gamache, New Hampshire Bureau of Trails, May 29, 2019.

[17] United States Fish and Wildlife Service, "2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation", page 23, (accessed June 19, 2019, https://www.census.gov/prod/2013pubs/fhw11-nh.pdf).

data on number of campsites came from multiple sources, including the White Mountain National Forest[18], the National Association of State Park Directors[19], and the New Hampshire Campground Owners Association. On the other hand, spending in preparation for trip by landowner type was estimated using average occupancy ratios per landowner types. This information was provided by the New Hampshire Campground Owners Association.[20]

In a hypothetical year with $100 million of camper spending, $83.6 million would be estimated to occur on private land, $6.3 million on federal land, and $10.1 million on state land. No data on campsites was available on municipal land.

Table 12 Camping Site Nights by Landowner Type

Landowner Type	Site Nights	Percent
Private	825,995	83.0%
Federal	46,056	4.6%
State/ Municipal	122,887	12.4%
Total	994,938	100.0%

Note: These figures are not exact and based on an 'assumption' by the New Hampshire Campground Owners Association.[21]

RVing

Like Climbing/Hiking/Tent Camping, RVing spending by landowner type was estimated based on the number of campsites on private lands, the White Mountain National Forest, and state parks. It also assumes spending is proportional to campsites (see Climbing/Hiking/Tent Camping above). The data in table 13 uses the same source data and assumptions.

Table 13 RVing Site Nights by Landowner Type

Landowner Type	Site Nights	Percent
Private	43,791	86.0%
Federal	0	0.0%
State/ Municipal	7,103	14.0%
Total	50,894	100.0%

Note: These figures are not exact and based on an 'assumption' by the New Hampshire Campground Owners Association.[22]

Bicycling and Equestrian

[18] Personal communication with Marianne Leberman, White Mountain National Forest, June 25, 2019.
[19] National Association of State Park Directors, "Statistical Report of State Park Operations: 2014-2015" (accessed July 2, 2019, https://www.nhstateparks.org/activities/camping/camping-rates).
[20] Personal communication with Gregg Pitman, New Hampshire Campground Owners Association, July 30, 2012 and December 18, 2019.
[21] Personal communication with Gregg Pitman, New Hampshire Campground Owners Association, July 30, 2012 and December 18, 2019.
[22] Personal communication with Gregg Pitman, New Hampshire Campground Owners Association, July 30, 2012 and December 18, 2019.

There is no forestland owner information specific to these activities. The spending on these activities are distributed to owner types based on forestland acreages. It assumes that spending is proportional to forestland acreages amongst owner types. In a hypothetical year with $100 million of spending, $60.4 million would be estimated to occur on private land, $27.3 million on federal land, $12.3 million on state and municipal land.

The estimate of 1,748,655 private acreages represents only 68 percent of total private acreages of 2,571,552. This is to reflect that only 68 percent of the Current Use forestland were reported not to post against any activities at all. Note that this adjustment should result in a conservative estimate for the private lands' economic value as percentage of Current Use forestlands that post specifically against bicycling or equestrian is unknown but likely much lower than 32 percent.

Table 14 Forestland Acreages by Landowner Type

Landowner Type	Acreage	Percent
Private	1,748,655	60.4%
Federal	791,066	27.3%
State/ Municipal	354,900	12.3%
Total	2,894,621	100.0%