

Introduction

The islands managed by Acadia National Park in the Gulf of Maine provide critical habitat for a variety of plant and animal species. During 1992 and 1993, the National Park Service inventoried biota on eight islands with help from Earthwatch volunteers.

With continuing climate change, updating the park's management plans to address the projected impact of climate change on the vulnerable natural resources of these islands is more important than ever.

To provide updated information on island dynamics, trajectory of forest change, and environmental drivers, we resampled the 33 permanent historical forest plots (Fig. 1) established on eight islands during 1992/93 (Fig. 2). Sampling concluded in September 2018.

Methods

We measured all trees > 2.5 cm within each 10 m x 10 m plot and recorded DBH, species, and status (live/dead) of each tree.

While we are currently focusing on preliminary analysis of the tree data, we also measured seedlings, saplings, and shrub stems, and estimated shrub and ground cover.

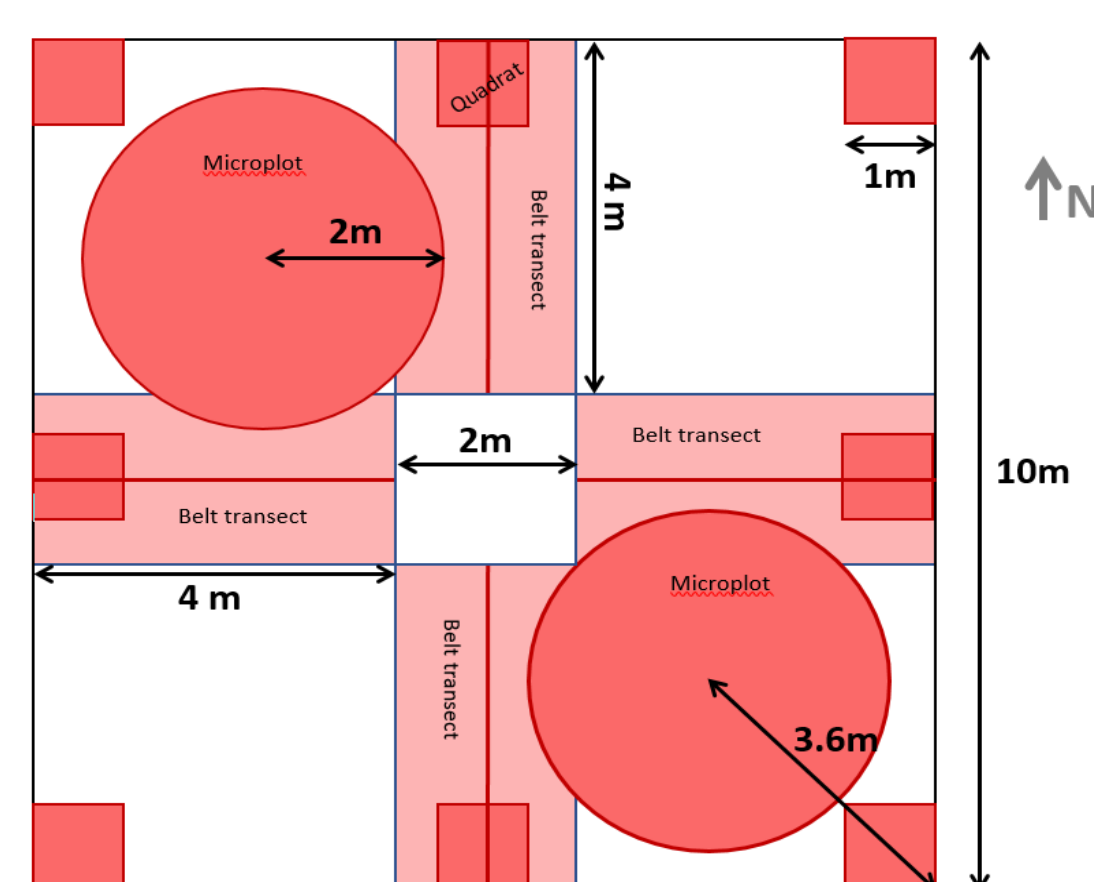


Fig. 1. Plot design detailing types of sampling.

Acknowledgements

Thank you to Schoodic Institute, Acadia National Park, Earthwatch Institute, and the Maine Timberlands Charitable Trust.

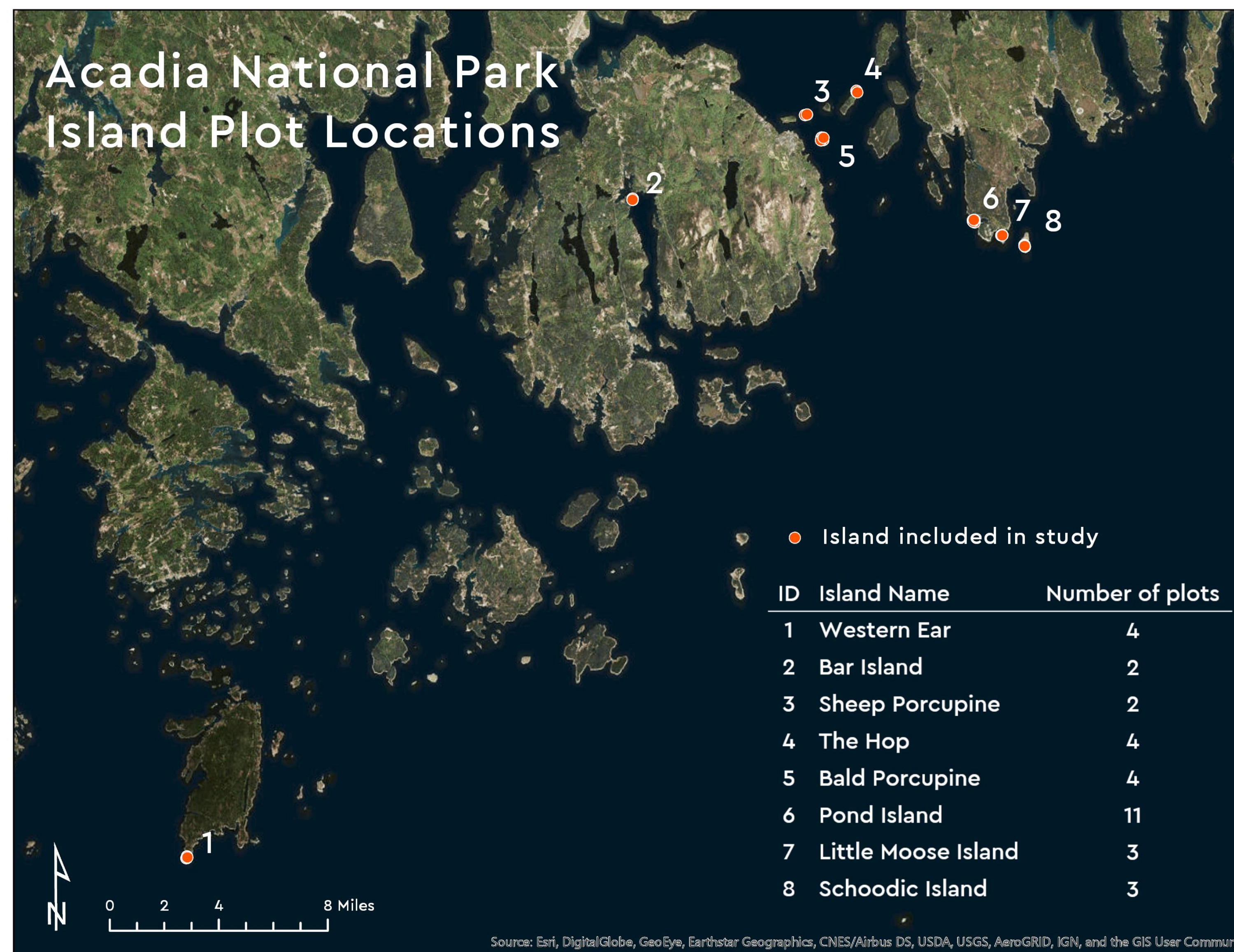


Fig. 2. Map of the eight Acadia National Park islands compared in this study.

Results

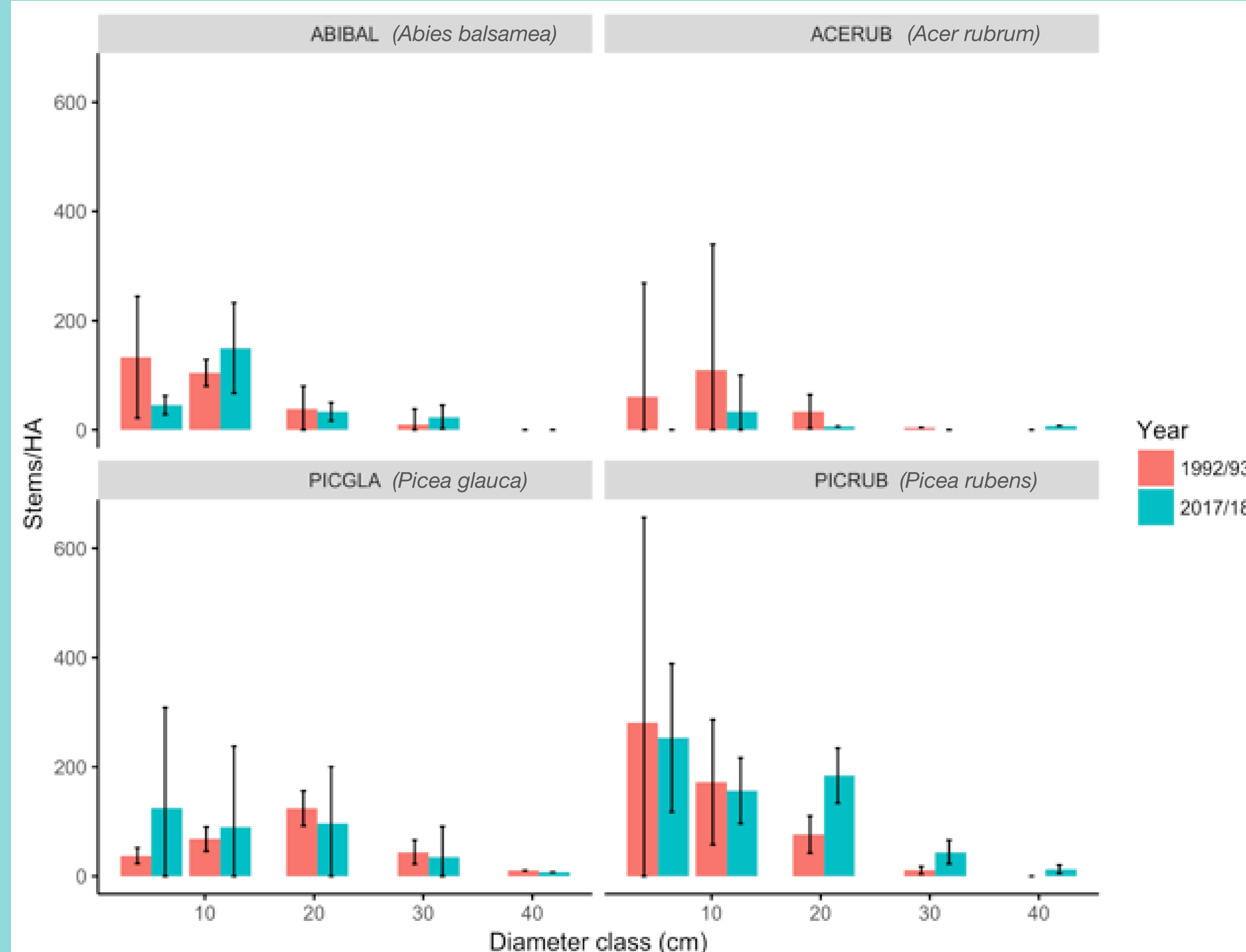


Fig. 3. Average stem density (stems/ha) of four most common tree species found across the eight Acadia National Park study islands in 1993 and 2018: balsam fir (ABIBAL), red maple (ACERUB), white spruce (PICGLA), and red spruce (PICRUB). Irregular diameter classes are due to conversion of 1992/93 diameter classes from inches to centimeters.

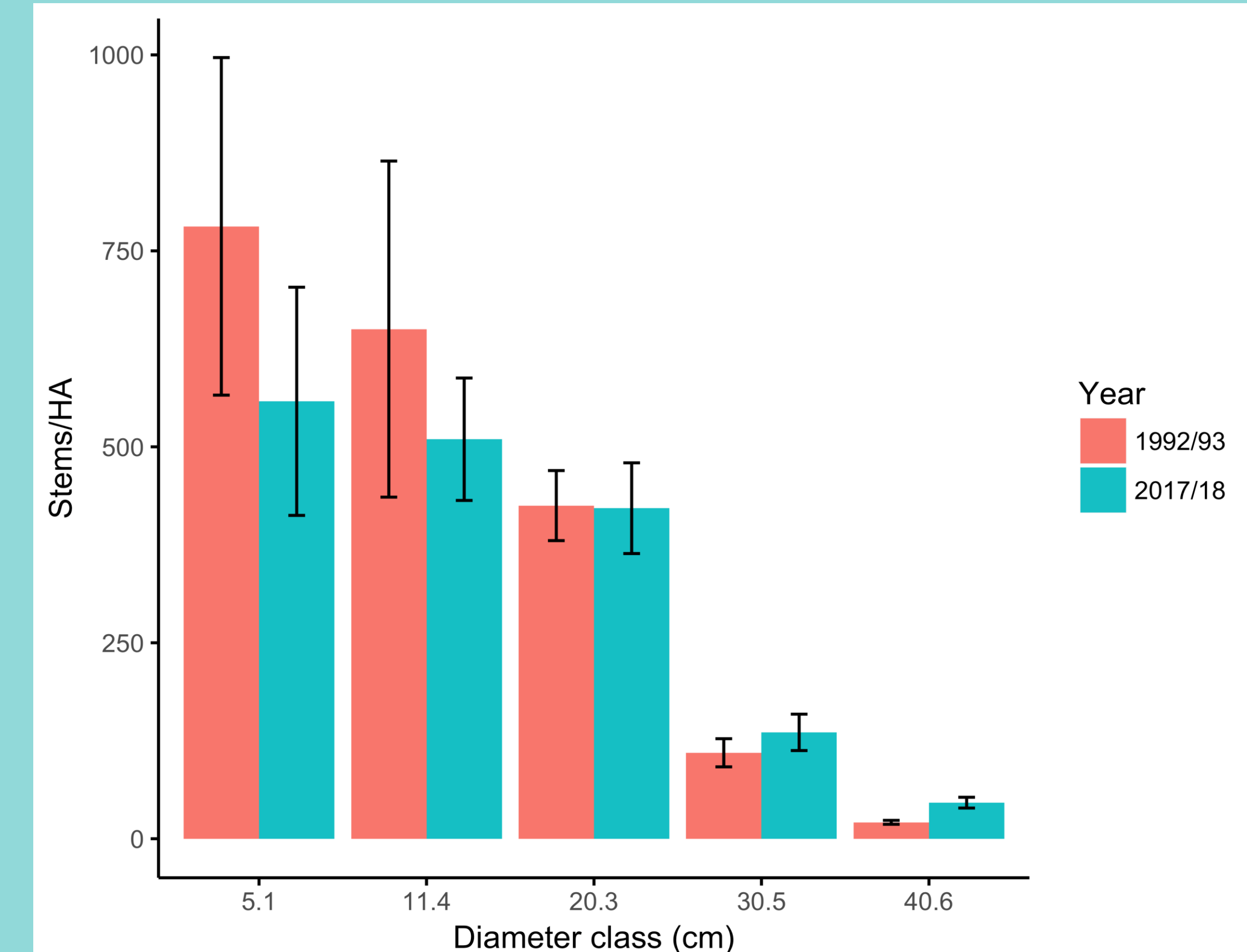


Fig. 4. Average stem density (stems/ha) of all species across the eight Acadia National Park study islands in 1992/93 and 2017/18.

Table 1. Summary values for most important tree species.

Spp.	1993					2018				
	BA/ha	Stems/ha	Rel. Den.	Rel. Dom.	Importance	BA/ha	Stems/ha	Rel. Den.	Rel. Dom.	Importance
<i>Abies balsamea</i>	3.29	286.17	0.14	0.10	0.12	4.28	251.99	0.15	0.12	0.13
<i>Acer pensylvanicum</i>	0.75	68.75	0.03	0.02	0.02	0.47	62.50	0.05	0.02	0.03
<i>Acer rubrum</i>	2.63	207.29	0.07	0.07	0.07	2.80	46.88	0.03	0.07	0.05
<i>Betula papyrifera</i>	1.83	79.45	0.04	0.06	0.05	1.12	42.05	0.03	0.05	0.04
<i>Picea glauca</i>	9.68	284.56	0.30	0.33	0.32	7.94	354.73	0.24	0.23	0.24
<i>Picea rubens</i>	5.61	540.91	0.18	0.15	0.16	12.07	650.85	0.32	0.29	0.31
<i>Pinus strobus</i>	0.01	6.25	0.00	0.00	0.00	2.32	31.25	0.01	0.03	0.02
<i>Populus tremuloides</i>	0.18	37.50	0.03	0.02	0.02	0.02	9.38	0.01	0.00	0.00
<i>Quercus rubra</i>	1.99	81.25	0.03	0.05	0.04	2.38	50.00	0.05	0.09	0.07
<i>Sorbus spp.</i>	0.37	37.50	0.02	0.02	0.02	0.11	41.67	0.02	0.00	0.01
<i>Thuja occidentalis</i>	1.82	50.00	0.02	0.04	0.03	1.24	28.13	0.02	0.06	0.04

Discussion

Based on this preliminary analysis, island forests have experienced minor changes in structure and composition over the past 25 years (Fig. 3, 4). Changes in diameter distribution, density, and basal area are consistent with patterns of maturing forests – as forests exit the stem exclusion phase, stem density decreases and basal area increases. Future analyses will focus on tree mortality, regeneration, and comparisons to forests across Acadia.

Citizen Science

Intrepid Earthwatch volunteers engaged in the field work and data collection in both 1992/93 and 2017/18 (Fig. 5). Thank you!



Fig. 5. Earthwatch volunteers measure tree DBH.