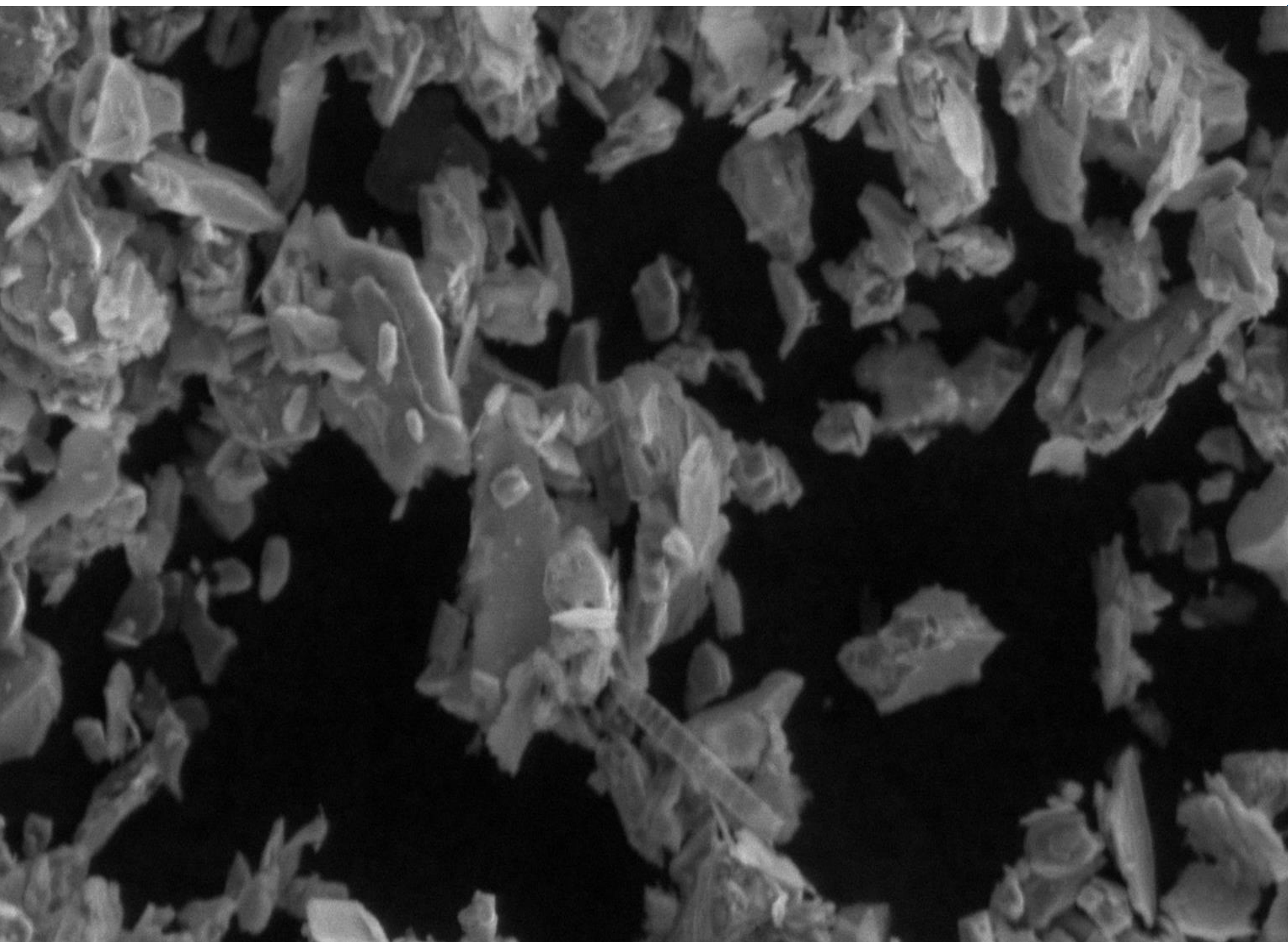


Feasibility of Glacial Rock Flour (GRF) as an alternative cementitious binder through Alkali Activation (AA) and Mariculture ByProducts (MBP) for use as a Viscosity Modifying Agent (VMA)

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SEM Image of the raw Lowe River (Valdez, AK) GRF sample

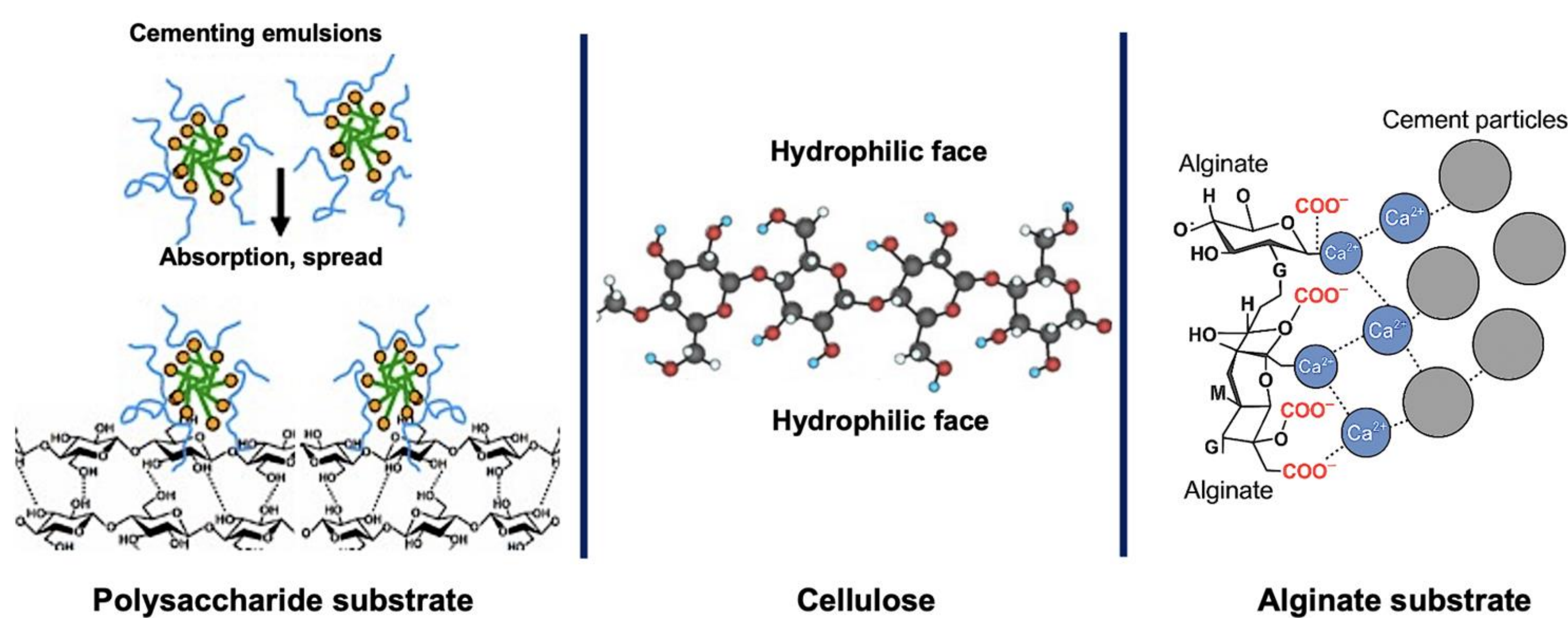
In Situ Resource Utilization: Glacial Till as a Portland Cement Replacement

Fine local sediments, such as glacial till, are promising primary materials for developing alternative cements through alkali activation. These sediments can form geopolymeric binders with characteristics equivalent to—or even superior to—those of Portland cement. Such geopolymers have a wide range of applications, including soil stabilization, pavement construction, manufactured aggregates, and other infrastructure and construction uses.

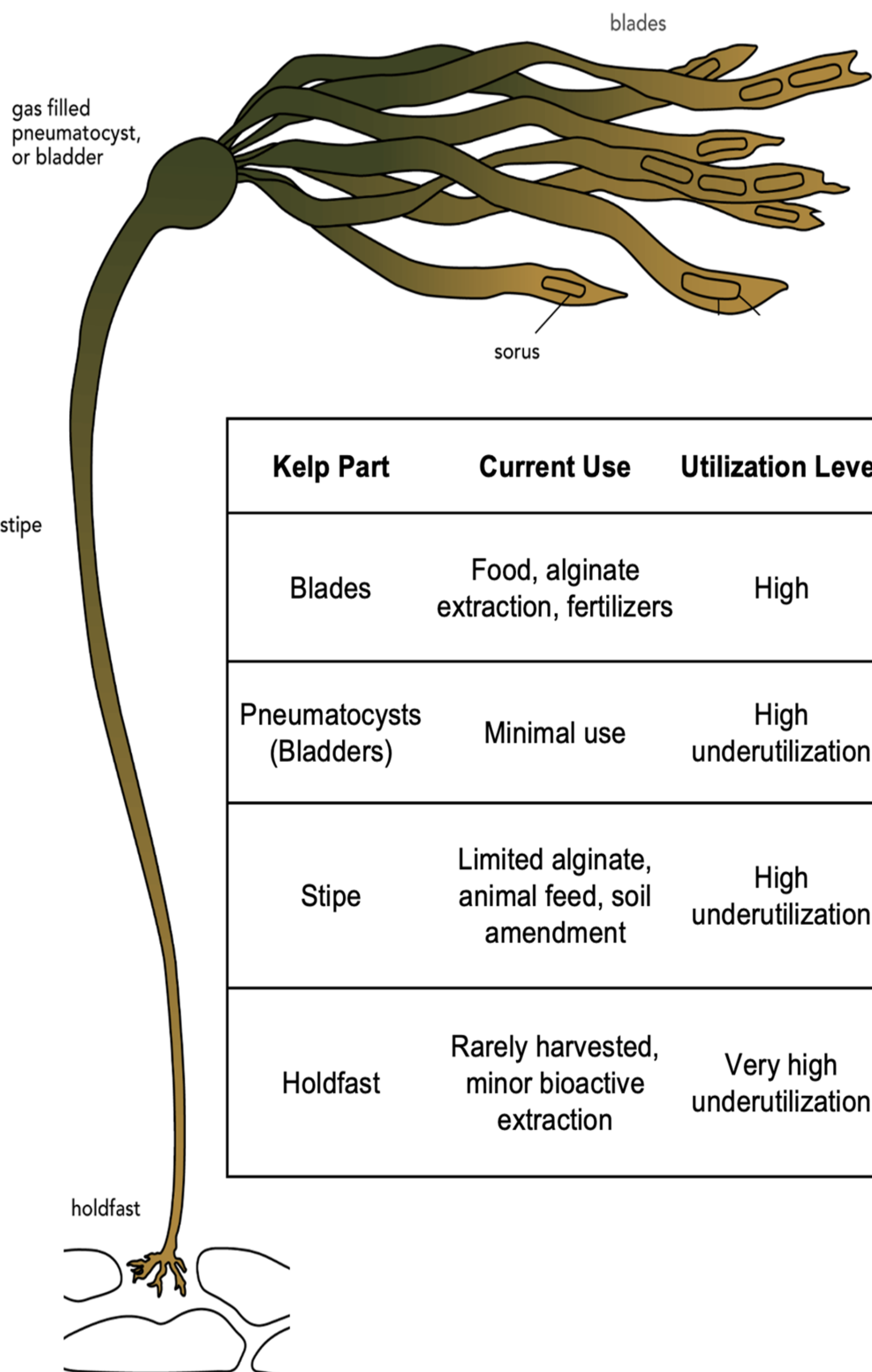
In Situ Resource Utilization: Alaskan Kelp for Alaskan Building Products

The Alaska Mariculture Industry produces hundreds of thousands of pounds of kelp each year. The key challenge within this industry, currently, is finding large scale uses for the kelp that is being grown. Kelp has been used (and is being used) in building products such as roof thatching, insulation, and as partial replacements for Portland cement. Leveraging existing methodologies and developing new ones for use with Alaskan kelp byproducts has high potential across the construction industry, particularly in cementitious composite materials and concrete 3-D printing.

Acting Mechanism of Bio-Based VMA



Kelp components utilization level vs. potential use for Bio-VMA



Kelp Part	Current Use	Utilization Level	Potential for Bio-VMA
Blades	Food, alginate extraction, fertilizers	High	Moderate – residues after alginate extraction could be valorized
Pneumatocysts (Bladders)	Minimal use	High underutilization	Moderate – trace polysaccharides and minerals
Stipe	Limited alginate, animal feed, soil amendment	High underutilization	Strong – rich in structural polysaccharides suitable for VMA extraction
Holdfast	Rarely harvested, minor bioactive extraction	Very high underutilization	Moderate – complex polysaccharides and phenolics with extraction potential