Timely, accurate detection of southern pine beetle (*Dendroctonus frontalis* Zimmerman; SPB) outbreaks is necessary for management of this tree-killing beetle (Billings 2011). Early detection is key, and is effectively accomplished in the historical range using aerial flyovers (Billings 1979; Billings and Pase III. 1979). Early stress detection in plants is correlated to changes in reflectance just beyond the visible light spectrum (Horler et al. 1983). Thus, researchers have looked beyond the visible light spectrum for early attack detection in bark beetle systems, with many studies focusing on *Ips typographus* L. in Europe (Table 1). We seek to detect early attack (or green attack) of southern pine beetle in Long Island pitch pines (*Pinus rigida* Mill.).

Bark beetle	Host tree	Methodology	Relevance
European spruce bark beetle (*Ips typographus* L.)	Norway spruce (*Picea abies* (L.) H. Karst.)	UAV-based multispectral imagery	Successful early attack detection; creation of new spectral indices (Huo et al. 2023)
		UAV-based hyper- and multispectral imagery	Preliminary results show successful early attack detection (Honkavaara et al. 2020)
		Gyrocopter-based hyperspectal imagery; Spectroradiometry: ASD FieldSpec-3	Successful early attack detection using custom index HI-1 (Hellwig et al. 2021)
		Satellite imagery: Sentinel-2, Landsat-8	Sentinel-2 more accurately maps early attack than Landsat-8 (Abdullah et al. 2019a)
		Satellite imagery: SPOT-5, RapidEye; Spectroradiometry	Red-edge and SWIR bands allowed for earlier attack detection (Abdullah et al. 2019b)
		UAV-based hyperspectral imagery	Successful early attack detection, but not as early as classic field surveys (Bárta et al. 2022)
		UAV-based multispectral imagery	Successful early attack detection using Greenness Index (Klouček et al. 2019)
		HyMap hyperspectral imagery	Unsuccessful early attack detection (Fassnacht et al. 2014)
		UAV and fixed-wing aircraft-based hyperspectral imagery	Classification into 3 color classes (healthy, infested, dead). No green attack. (Näsi et al. 2018)
		UAV-based hyperspectral imagery	Classification into 3 color classes (healthy, infested, dead). No green attack. (Näsi et al. 2015)
Ips spp.	Norway spruce	Satellite imagery: Sentinel-2	Successful early attack detection (Bárta et al. 2021)
Red turpentine beetle (*Dendroctonus valens* LeConte)	Chinese pine (*Pinus tabuliformis* Carr.)	Spectroradiometry: ASD FieldSpec-4	Successful early attack detection (Gao et al. 2022)
		UAV-based hyperspectral imagery	Successful early attack detection (Gao et al. 2023)
		Satellite imagery: Gaofen-2, Sentinel-2	Unsuccessful attempt at early attack detection (Zhan et al. 2020)
Mountain pine beetle (MPB, *Dendroctonus ponderosae* Hopkins)	Lodgepole pine (*Pinus contorta* Dougl.)	UAV-based radiometric thermal imagery	Simulated green attack via girdling; variable results (Mckeeman 2022)
		Hyperspectral imagery	Successful early attack detection (Niemann et al. 2015)
		Field spectroradiometry; aerial photography	Poor early attack detection (Runesson 1991)
		Satellite imagery: QuickBird	Red-green index best separated red crowns from unattacked trees (Coops et al. 2006)
		Spectroradiometry: LI-COR	Foliar spectrometry suggests that early attack can be detected with multispectral sensors (Ahern 1988)
Douglas-fir beetle (*Dendroctonus pseudotsugae*)	Douglas-fir (*Pseudotsuga meziesii*)	Helicopter-based Hyperspectral imagery	Successful early attack detection (Lawrence and Labus 2003)
Spruce beetle (*Dendroctonus rufipennis* (Kirby))	Engelmann spruce (*Picea engelmannii* (Parry ex Engelm))	Field spectroradiometry; Landsat TM	Multispectral indicators of early attack can be developed (Foster et al. 2017)
Southern pine beetle (SPB, *Dendroctonus frontalis* Zimm.)	Shortleaf pine (*Pinus echinata* Mill.); Virginia pine (*Pinus virginiana* Mill.)	Color film aerial photography	Unsuccessful attempt at early attack detection (Ciesla et al. 1967)
	Shortleaf pine	Real-Time Digital Airborne Camera System II	NDVI differentiated heavily damaged and undamaged trees (Carter et al. 1998)
	Pitch pine (*Pinus rigida* Mill.)	Satellite imagery: Landsat-8	Assessed changes in SPB infestation severity (Meng et al. 2022)
	Loblolly pine (*Pinus taeda* L.)	Satellite imagery: Worldview-2	Principal components analysis increased the accuracy of SPB outbreak detection (Crosby et al. 2024)

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