Table S3. List and explanation of the features calculated for each image object. 22 features were retained to train the machine learning classification models (noted by ✓). Texture features were calculated from all bands in all directions (0°, 45°, 90°, 135°), and therefore show directional invariance.

Type		Feature	Definition
Spectral Indices	✓	Green-Red Vegetation Index (GRVI)	GRVI = (G - R) / (G + R); where G = green band, R = red band [74]. Closely correlated to NDVI [19].
	o	Normalized Difference Index Green-Blue	(G - B) / (G + B); where G = green band, B = blue band.
	o	Normalized Difference Index Red-Blue	(R - B) / (R + B); where R = red band, B = blue band.
	✓	Green Ratio (rG)	rG = G / (R + G + B); where G = green band, R = red band, B = blue band. Evaluates phenological shifts and productivity [69].
	✓	Red Ratio (rR)	rR = R / (R + G + B); where G = green band, R = red band, B = blue band. Objective is analogous to the Green Ratio, but the primary band of interest is red.
	✓	Blue Ratio (rB)	rB = B / (R + G + B); where G = green band, R = red band, B = blue band. Objective is analogous to the Green Ratio, but the primary band of interest is blue.
	✓	Greenness Excess Index (GEI)	GEI = 2*rG - (rR + rB); where rG = Green Ratio, rR = Red Ratio, rB = Blue Ratio [73]. May be a subtler indicator of phenological shifts than the Green Ratio [71,72].
	o	Visible atmospheric resistance index (VARI)	VARI = (G - R) / (G + R - B); where G = green band, R = red band, B = blue band [70]. Measure of canopy reflectance. VARI complements the Atmospherically Resistant Vegetation Index (ARVI), but this index uses only RGB bands to mitigate differences in illumination.
Layer Values	o	Mean Red Layer	Mean pixel value in an image object using the red band.
	o	Mean Green Layer	Mean pixel value in an image object using the green band.
	o	Mean Blue Layer	Mean pixel value in an image object using the blue band.
	o	Standard Deviation Red Layer	Standard deviation of pixel values in an image object using the red band.
	✓	Standard Deviation Green Layer	Standard deviation of pixel values in an image object using the green band.
	✓	Standard Deviation Blue Layer	Standard deviation of pixel values in an image object using the blue band.
	o	Mean Brightness	Mean pixel intensity in an image object using all available bands.
	o	Mean Maximum Difference	Maximum pixel value subtracted by the minimum pixel value in each available band for an image object. Values are averaged.
	✓	Hue	Transformation of the red, green, blue (cube) color space into the hue, saturation, intensity (cylindrical) color space. Hue describes the dominant color of an image object.
	o	Saturation	Saturation describes the purity of color; that is, the shades of gray present in an image object. An image object without any gray (pure color) is unsaturated, while an image object with gray only is fully saturated.
	✓	Intensity	Also referred to as brightness or value, intensity describes the degree of brightness in an image object.

Table S3. Continued.

Type		Feature	Definition
Geometry (Extent)	✓	Area	Number of pixels in an image object.
	✓	Border length	Length (in pixels) of the outside border of an image object.
	✓	Length	Length (in pixels) of an image object.
	✓	Length-to-Width Ratio	Length (in pixels) divided by width (in pixels) of an image object.
	✓	Width	Width (in pixels) of an image object.
Geometry (Shape)	o	Asymmetry	Values increase with higher asymmetry. An ellipse is approximated around the image object, then the variance in length from the major to minor axis of the ellipse is calculated.
	✓	Compactness	Length (in pixels) multiplied by width (in pixels) of an image object, then divided by the total number of pixels in the image object. An image object with higher compactness generally has a smaller border and condensed core or area.
	✓	Density	Describes the pixel distribution in an image object. The densest shape is a square, while the least dense shape is a filament. Density is calculated based on a covariance matrix by dividing the number of pixels in an image object by its approximate radius.
	✓	Elliptic fit	Measures the fit or alignment between an image object and an ellipse. Values range from 0 (no fit) to 1 (perfect fit).
	✓	Radius of largest enclosed ellipse	Measures the similarity between an image object and an ellipse with the same area as the image object. A ratio is calculated between the radius of the largest enclosed ellipse to the radius of original ellipse.
	✓	Radius of smallest enclosing ellipse	Measures the similarity between an image object and an ellipse with the same area as the image object. A ratio is calculated between the radius of the smallest enclosing ellipse to the radius of original ellipse.
	o	Roundness	Roundness describes the similarity of an image object to an ellipse. It is measured by subtracting the radius of the largest enclosed ellipse by the smallest enclosing ellipse.
Texture [67]	✓	Homogeneity	Measure of uniformity. Homogeneity is a weighted measure that decreases exponentially with greater distance from the GLCM diagonal.
	✓	Contrast	Measure of inertia. Contrast is a weighted measure that increases exponentially with greater distance from the GLCM diagonal. Contrast generally opposes homogeneity. The higher the contrast, the lower the homogeneity (or uniformity) tends to be.
	o	Dissimilarity	Dissimilarity is a weighted measure that increases linearly with greater distance from the GLCM diagonal.
	o	Angular Second Moment (ASM)	Measure of energy. The value for ASM is largest when the pixel value differences are constant (uniform or orderly).
	✓	Entropy	Measure of spatial disorder or randomness. Entropy generally opposes ASM. The value for entropy is largest when the pixel value differences are inconstant (variable or disordered).