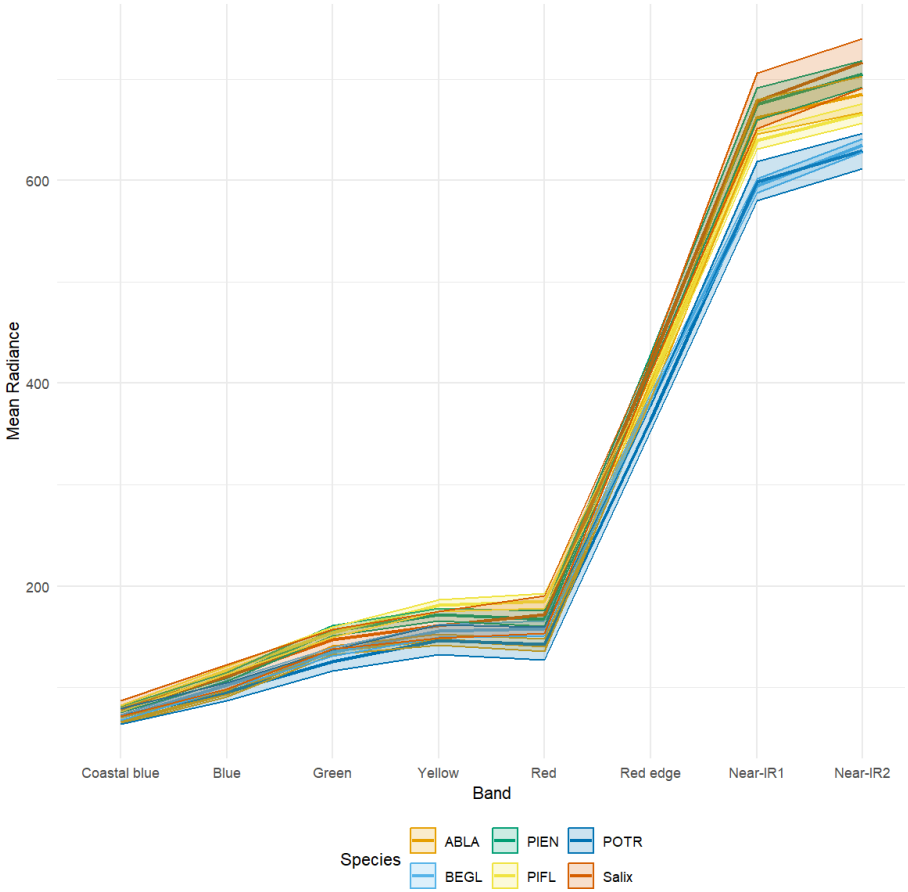

Figure 1. Surface reflectance for all species

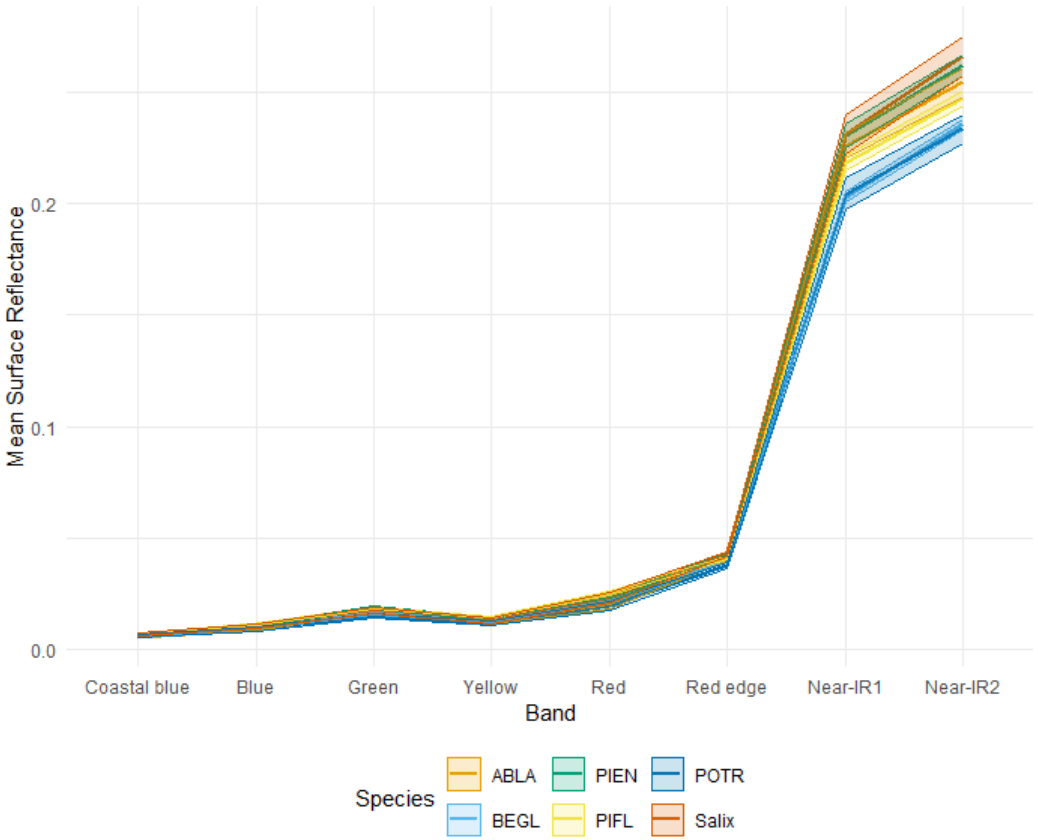

Figure 2. Surface radiance for all species

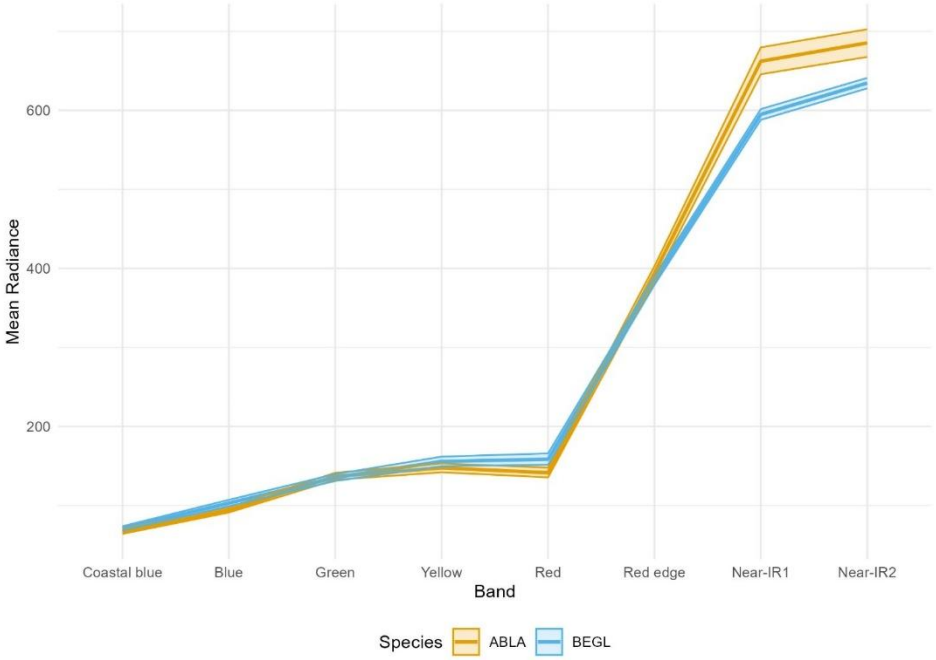

Figure 3. Surface radiance for ABLA vs. BEGL

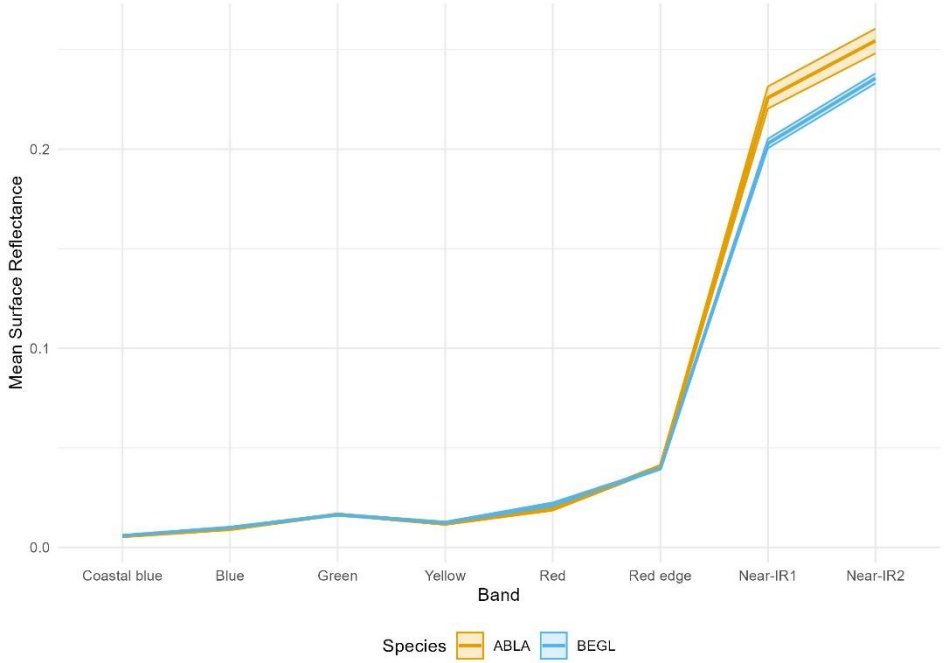

Figure 4. Surface reflectance for ABLA vs. BEGL

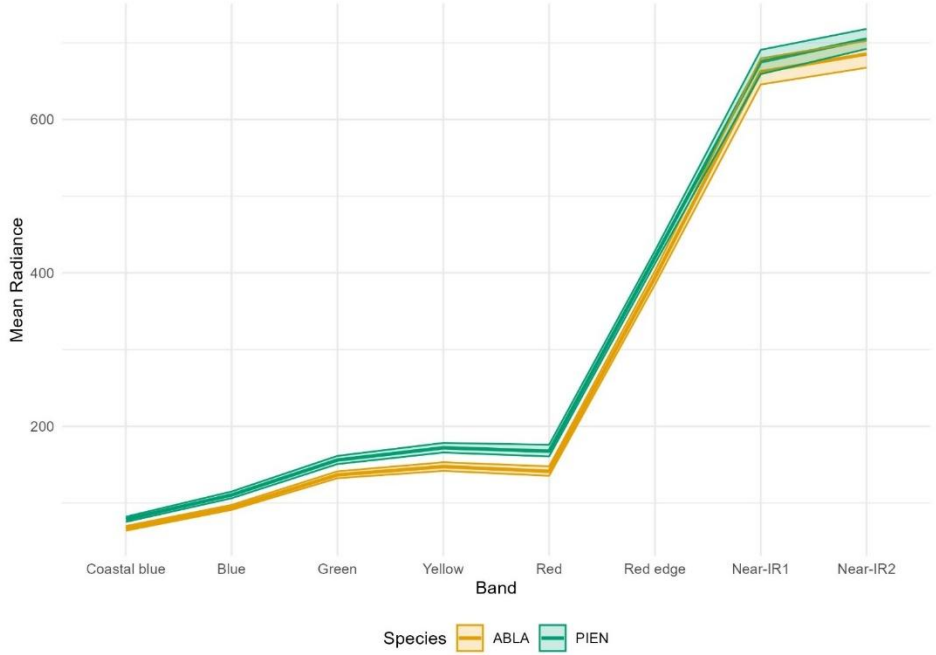

Figure 5. Surface radiance for ABLA vs. PIEN

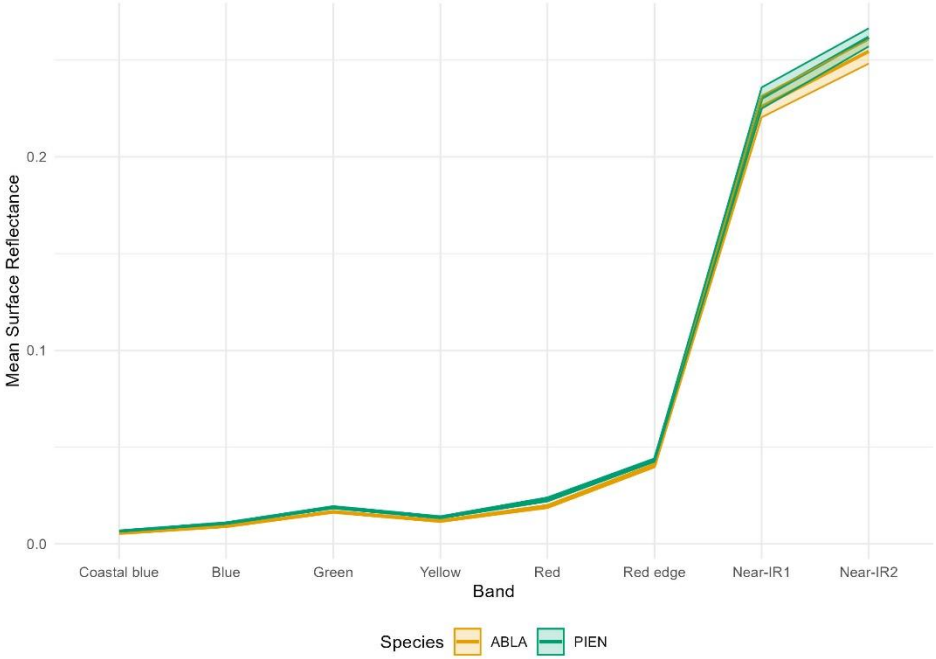

Figure 6. Surface reflectance for ABLA vs. PIEN

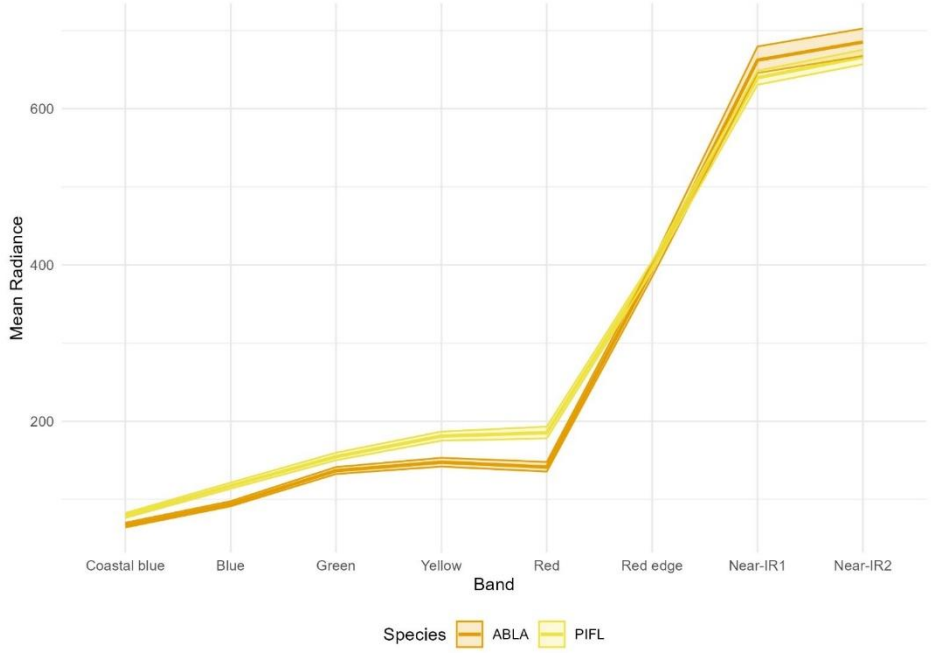

Figure 7. Surface radiance for ABLA vs. PIFL

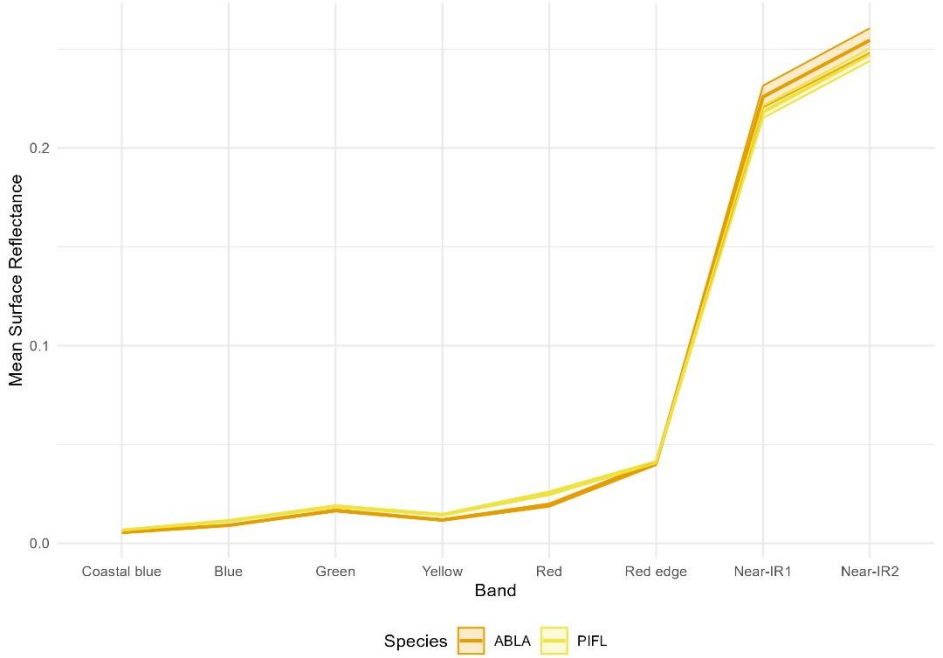

Figure 8. Surface reflectance for ABLA vs. PIFL

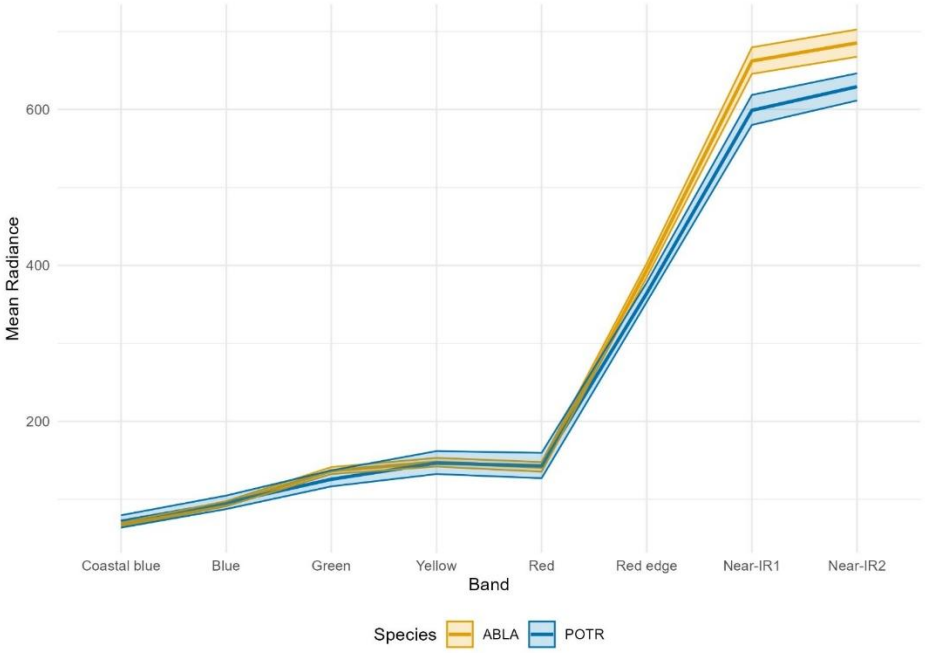

Figure 9. Surface radiance for ABLA vs. POTR

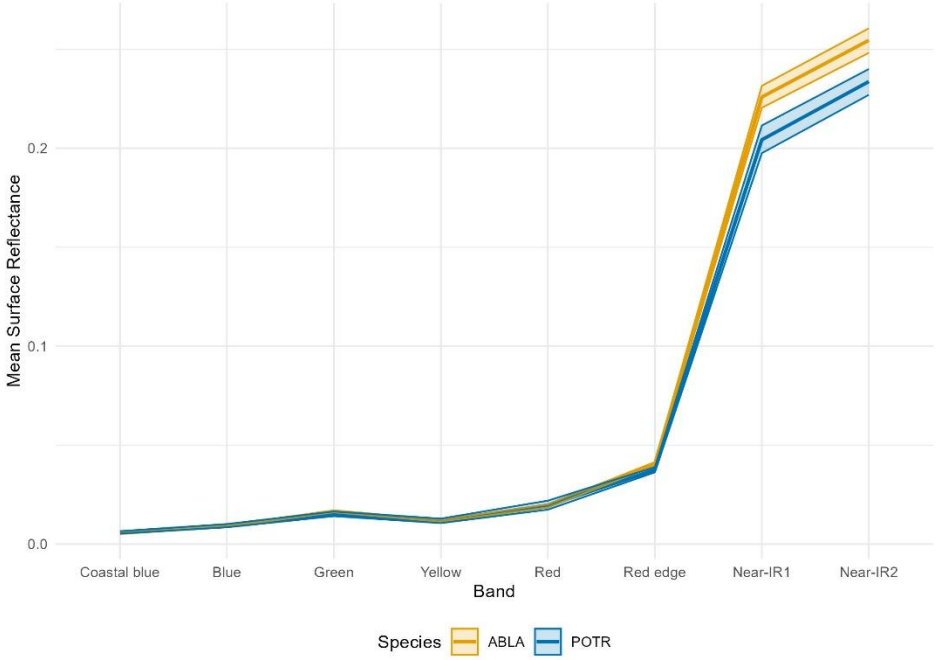

Figure 10. Surface reflectance for ABLA vs. POTR

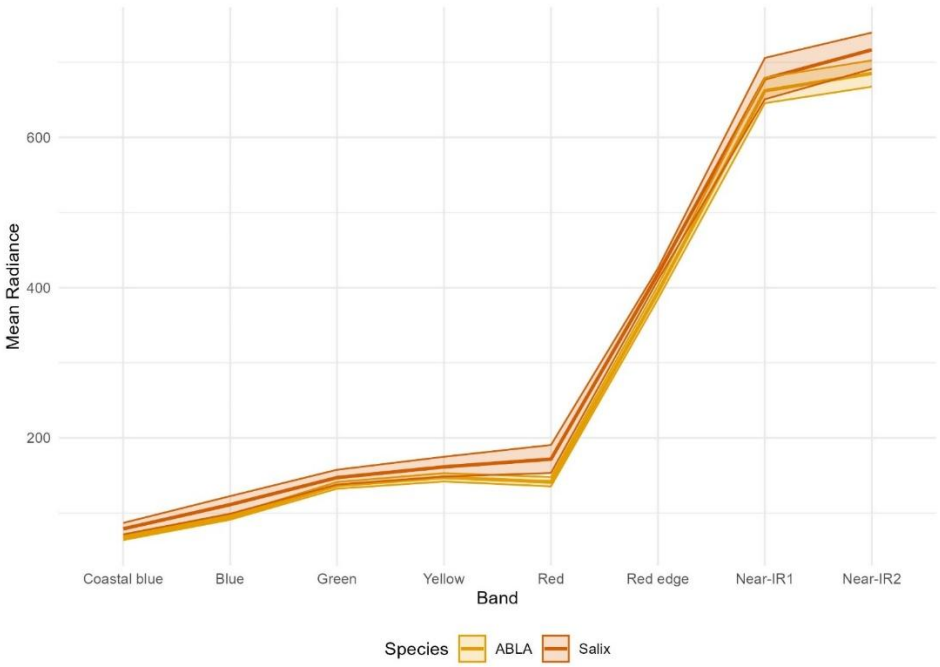

Figure 11. Surface radiance for ABLA vs. Salix

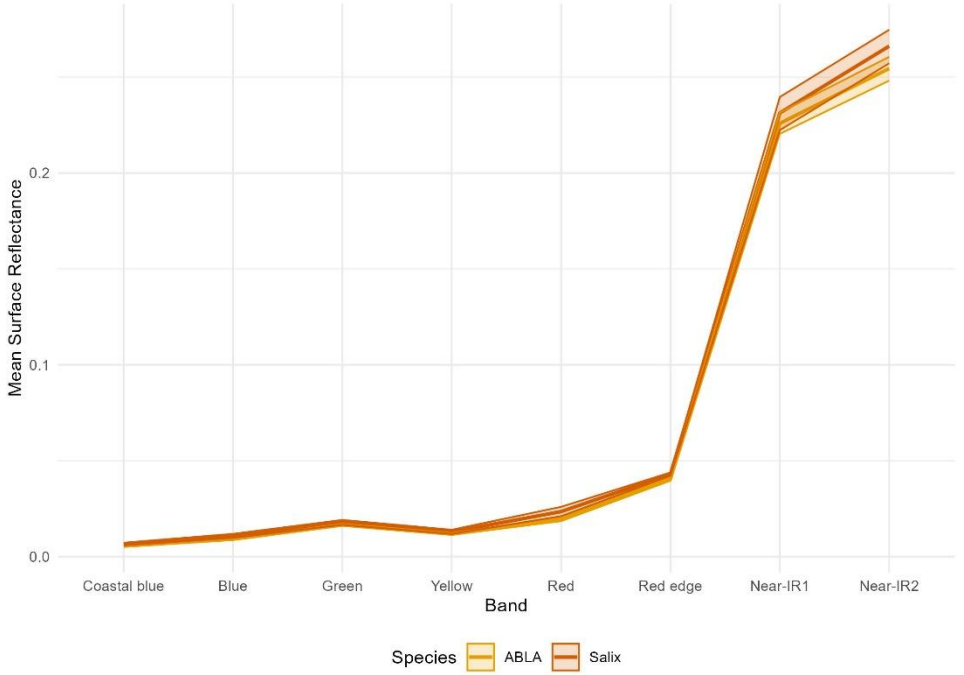

Figure 12. Surface reflectance for ABLA vs. Salix

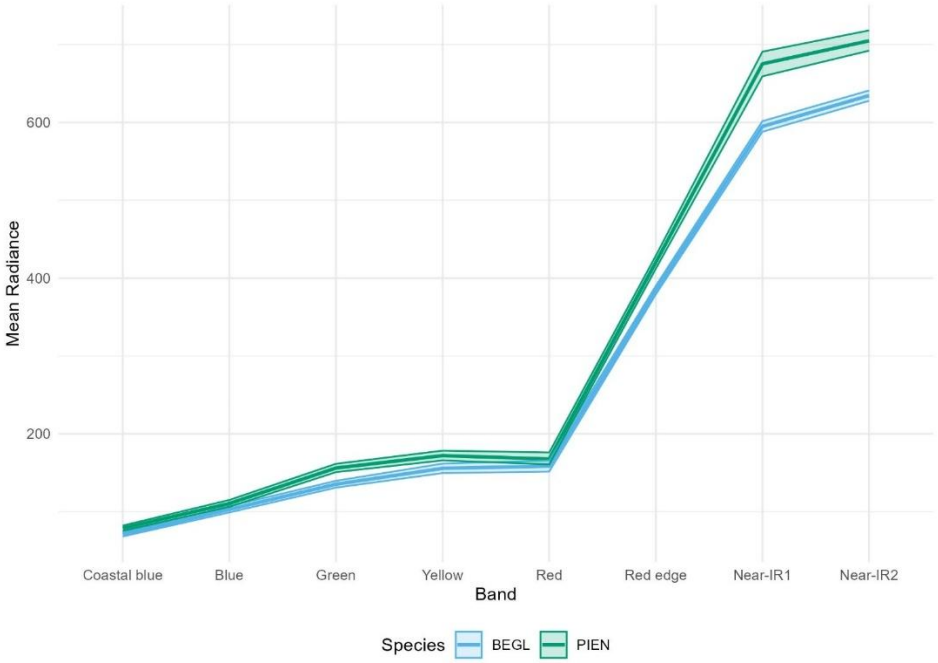

Figure 13. Surface radiance for BEGL vs. PIEN

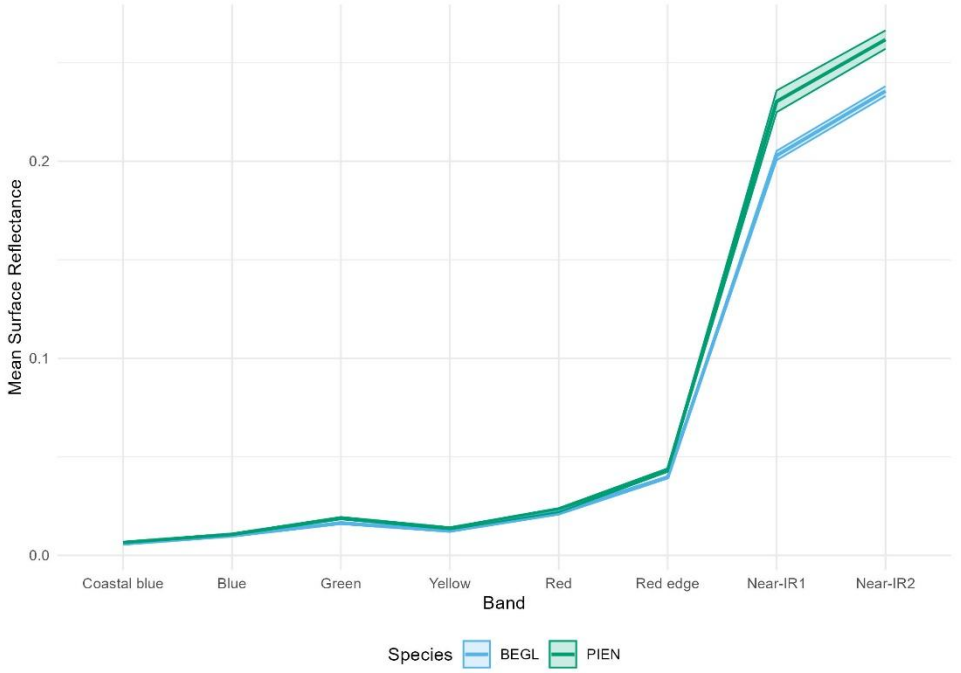

Figure 14. Surface reflectance for BEGL vs. PIEN

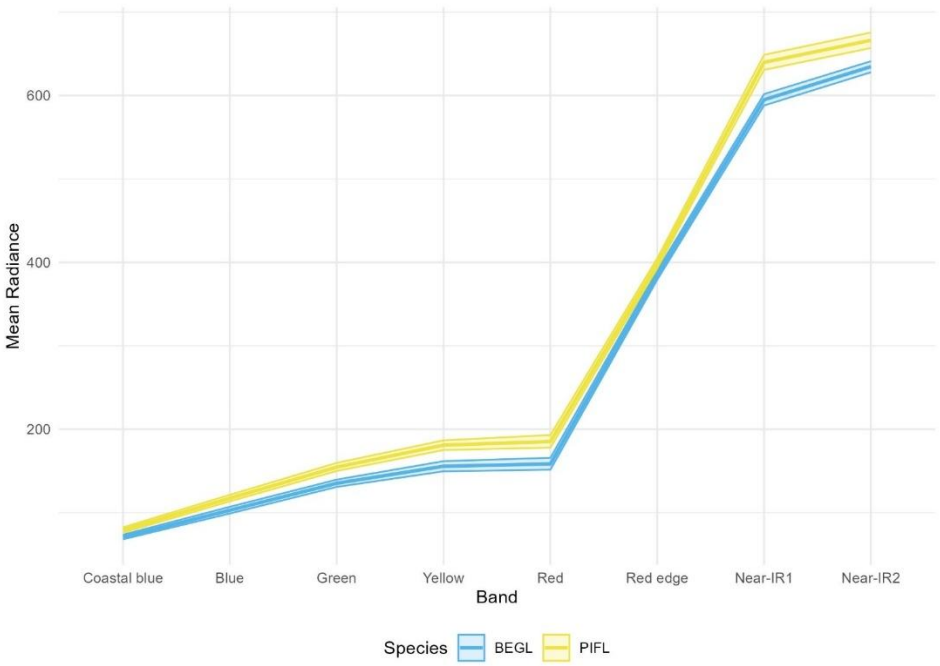

Figure 15. Surface radiance for BEGL vs. PIFL

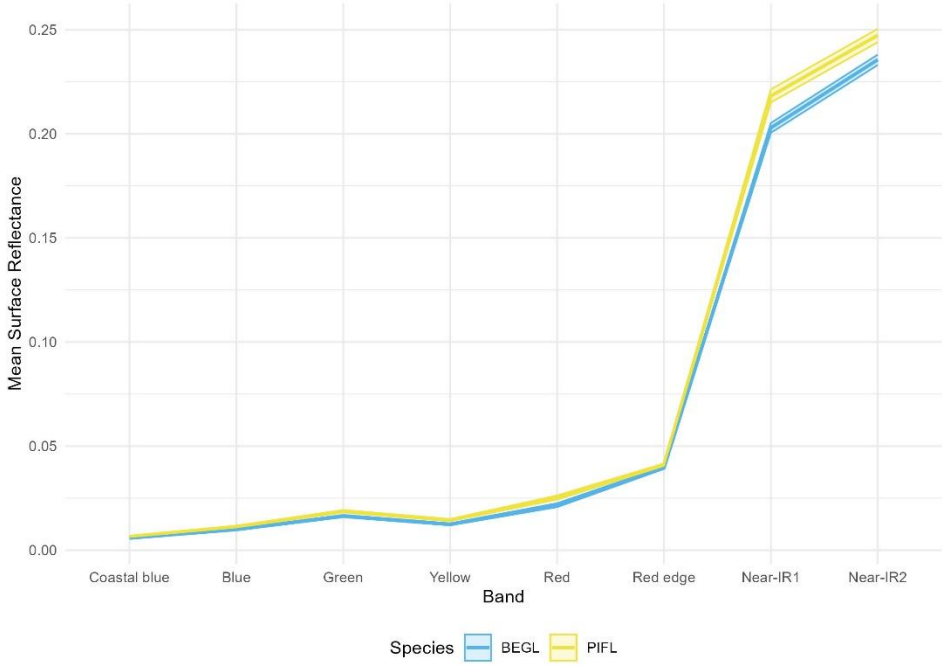

Figure 16. Surface reflectance for BEGL vs. PIFL

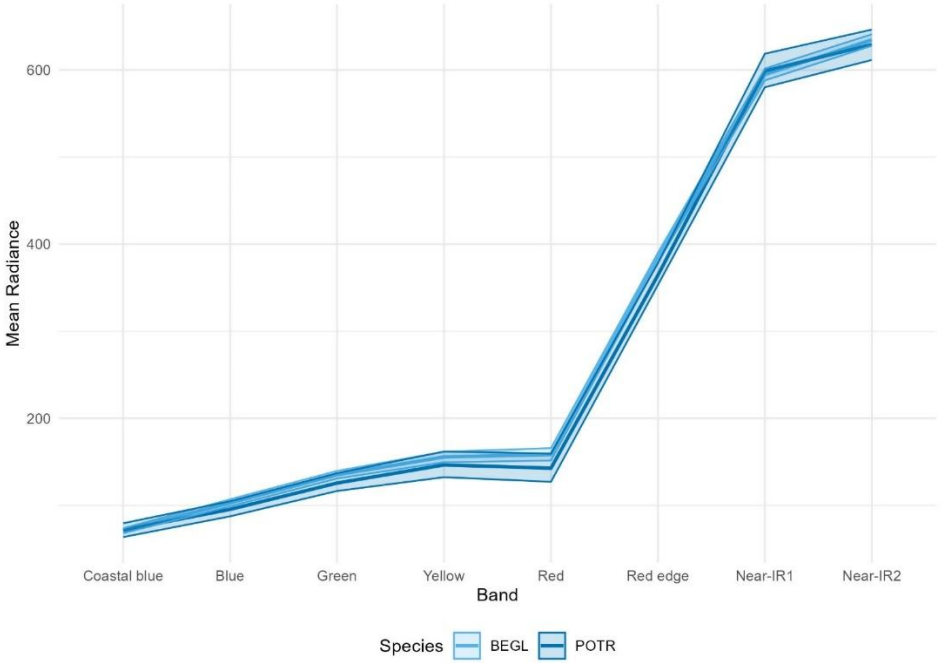

Figure 17. Surface radiance for BEGL vs. POTR

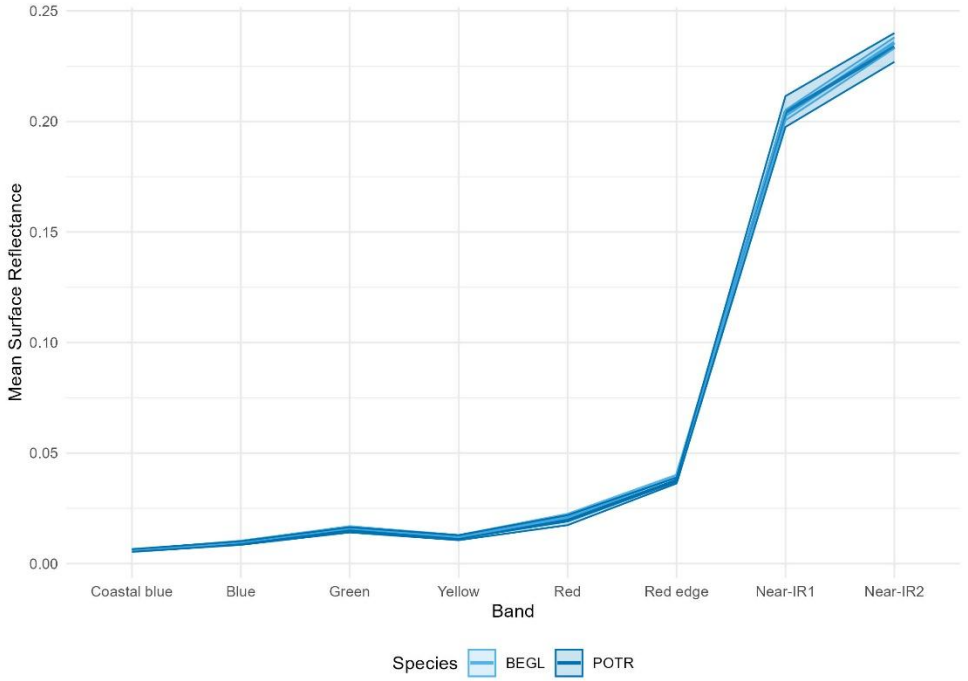

Figure 18. Surface reflectance for BEGL vs. POTR

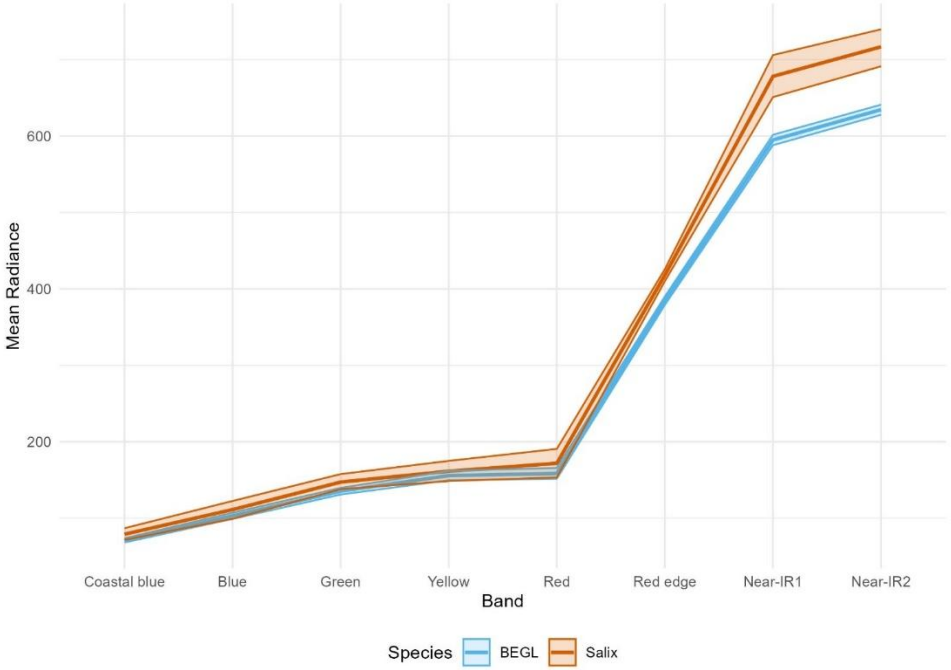

Figure 19. Surface radiance for BEGL vs. Salix

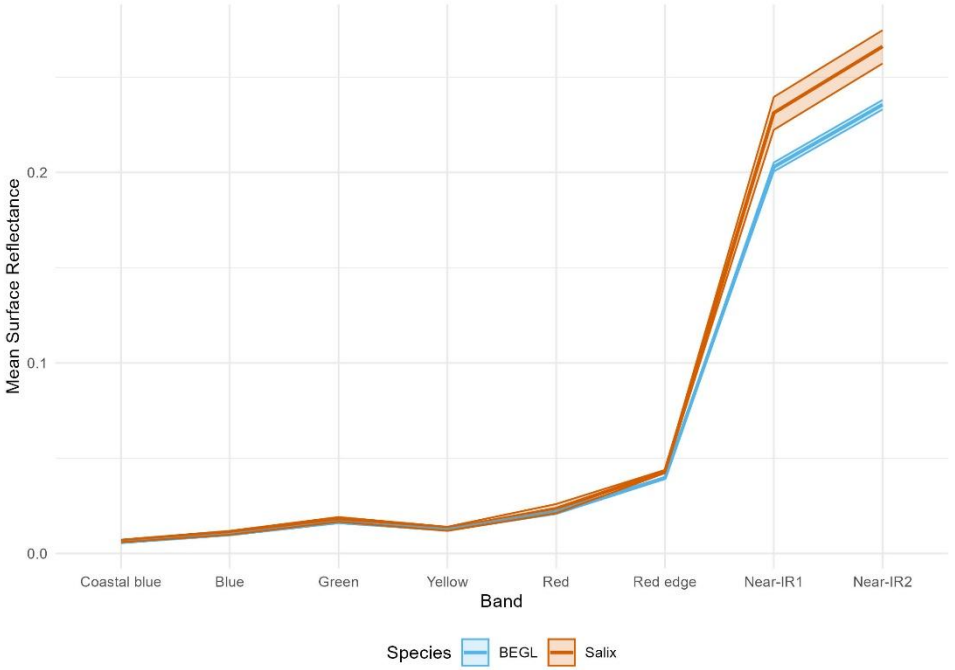

Figure 20. Surface reflectance for BEGL vs. Salix

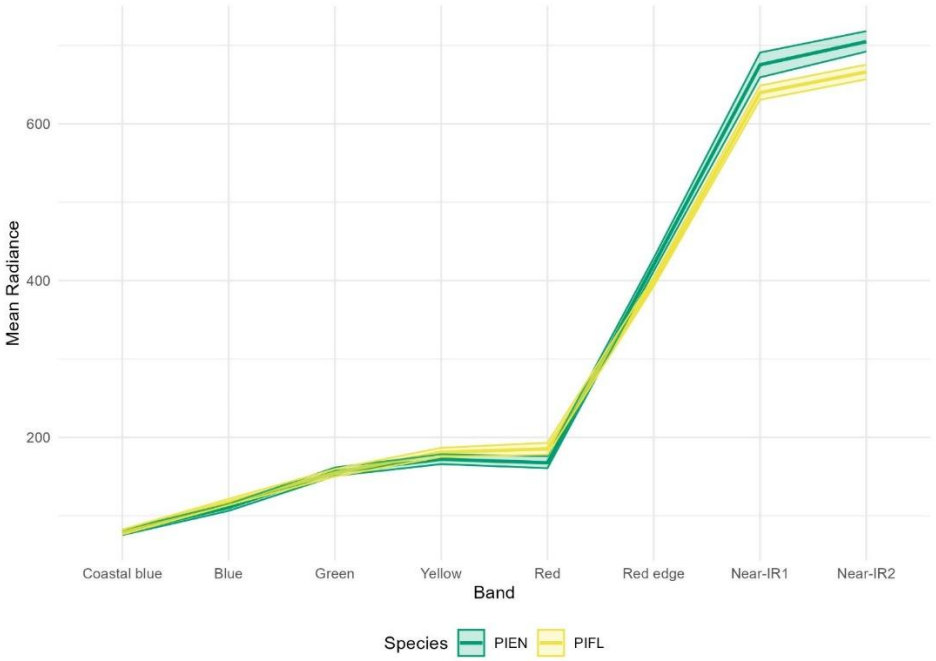

Figure 21. Surface radiance for PIEN vs. PIFL

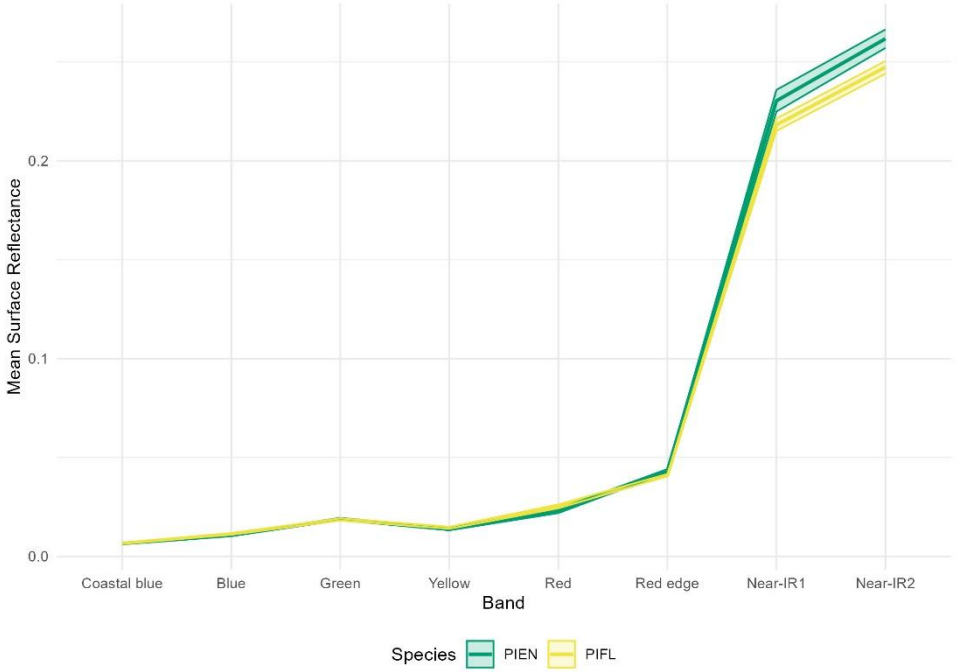

Figure 22. Surface reflectance for PIEN vs. PIFL

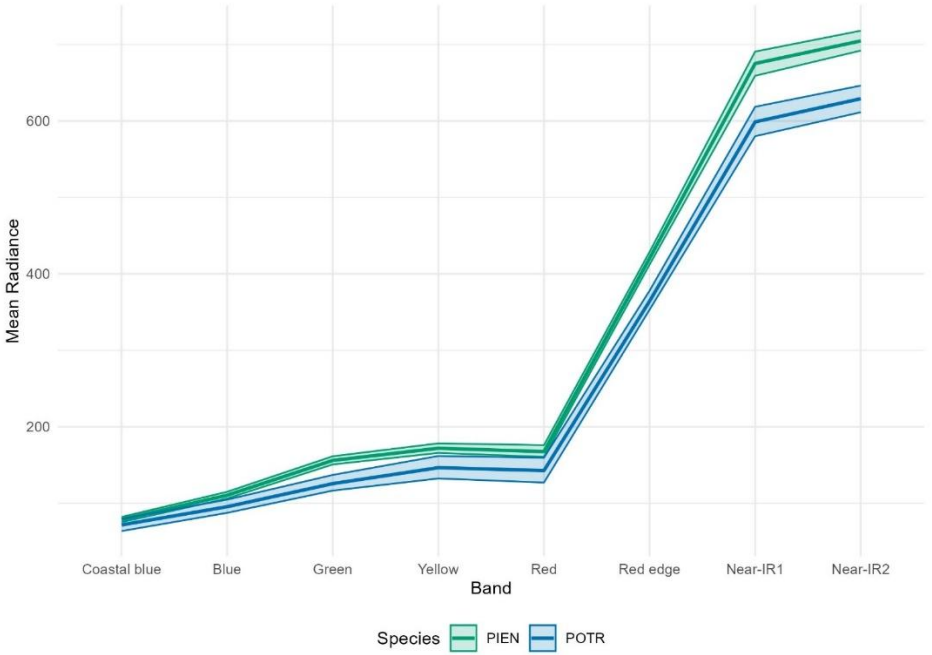

Figure 23. Surface radiance for PIEN vs. POTR

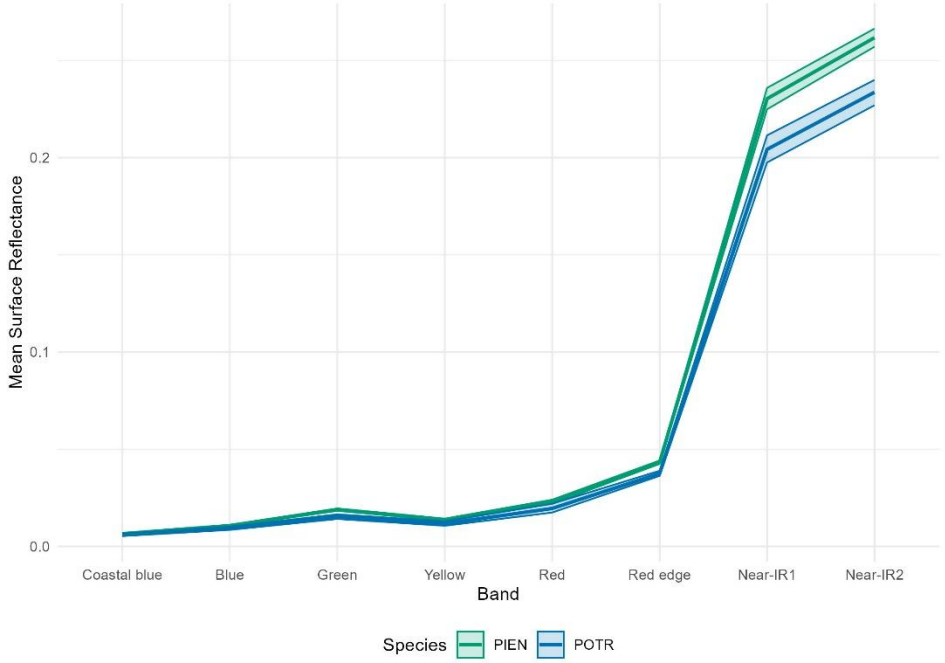

Figure 24. Surface reflectance for PIEN vs. POTR

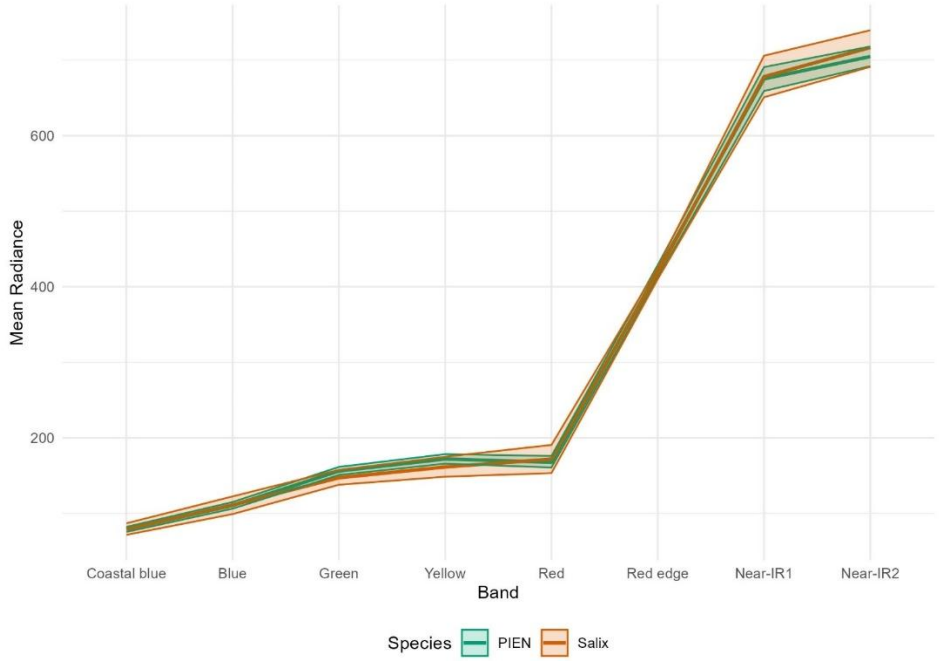

Figure 25. Surface radiance for PIEN vs. Salix

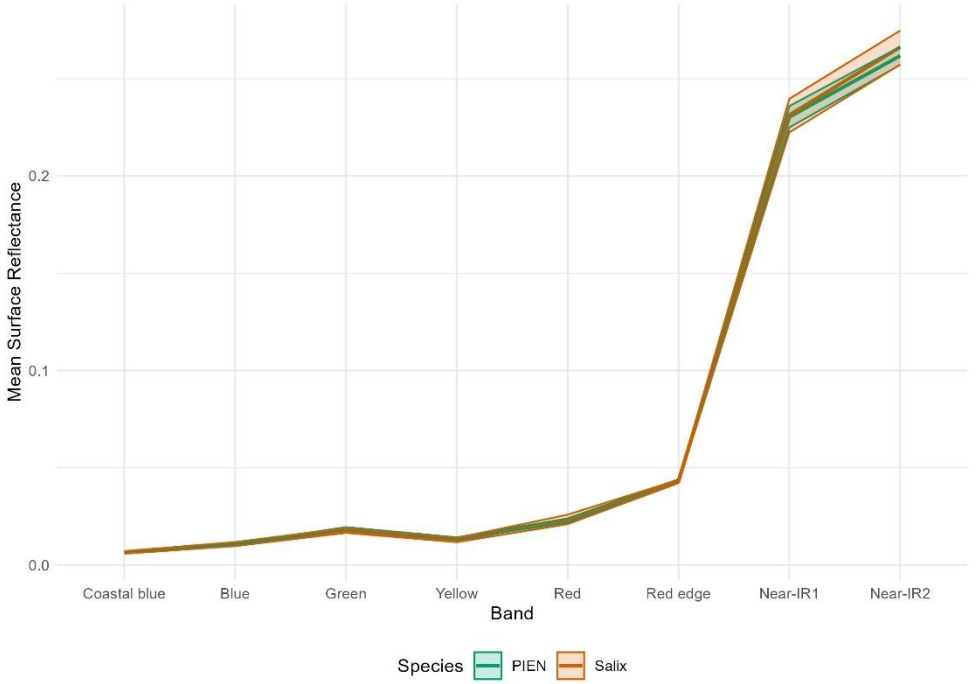

Figure 26. Surface reflectance for PIEN vs. Salix

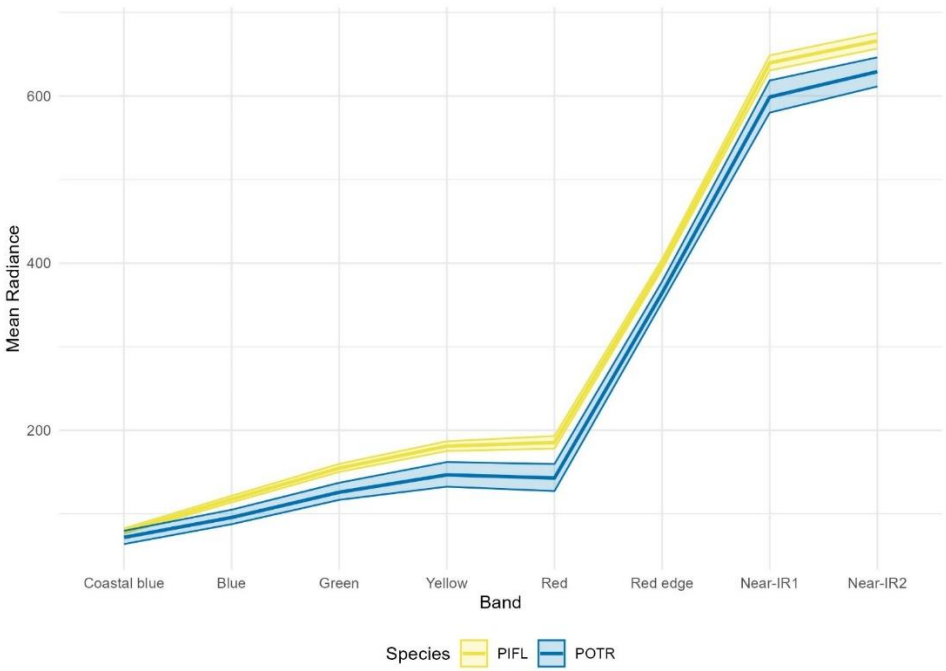

Figure 27. Surface radiance for PIFL vs. POTR

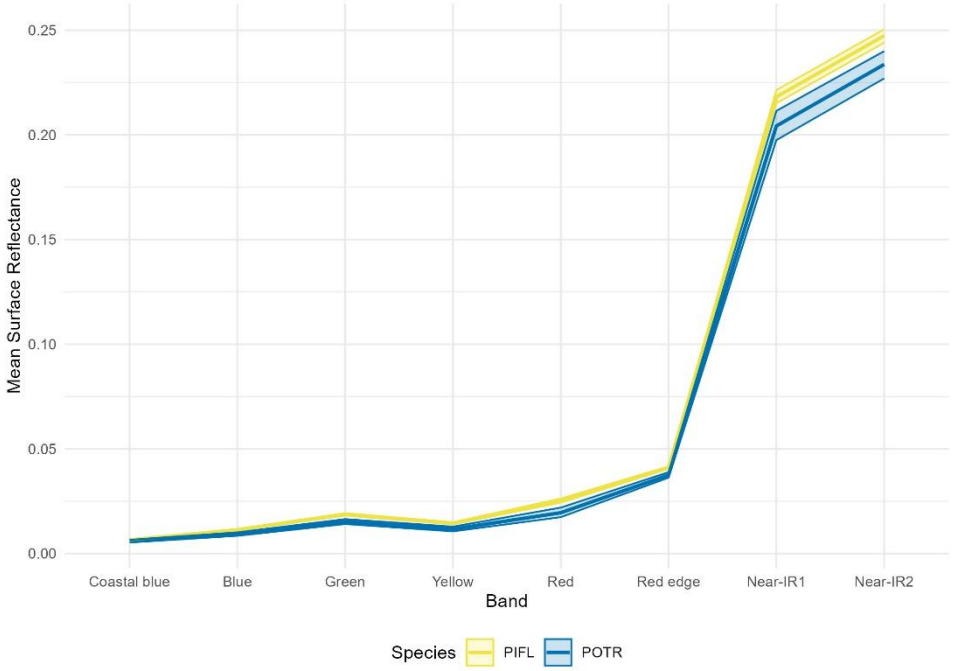

Figure 28. Surface reflectance for PIFL vs. POTR

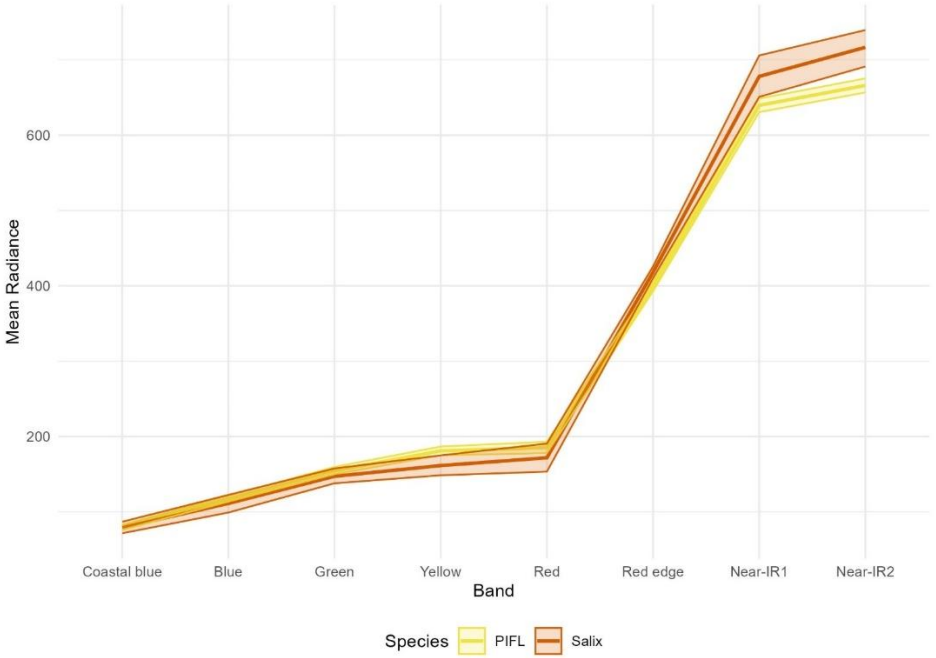

Figure 29. Surface radiance for PIFL vs. Salix

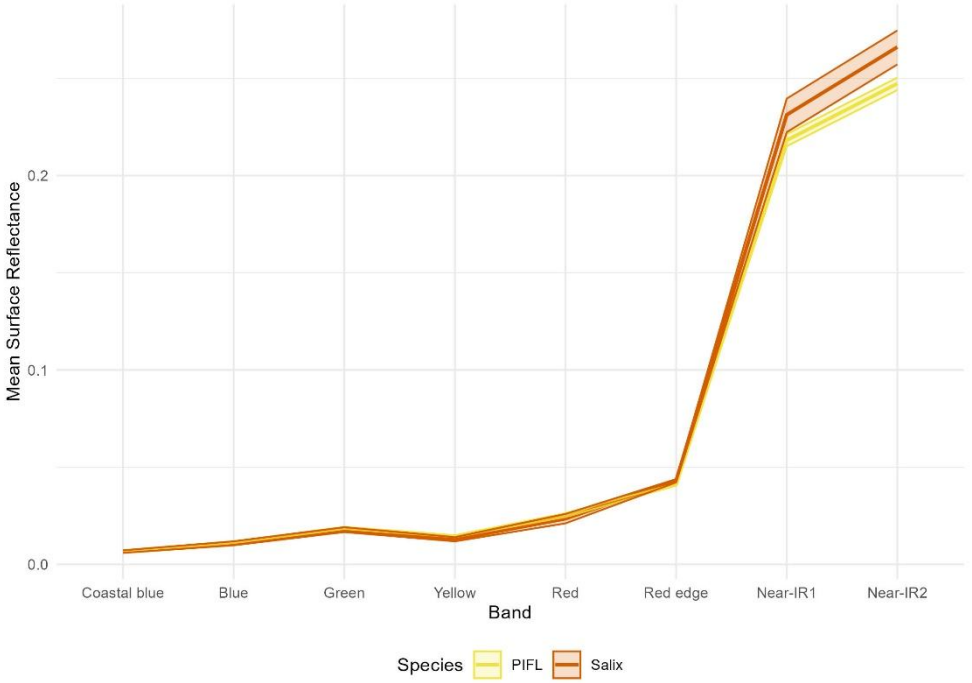

Figure 30. Surface reflectance for PIFL vs. Salix

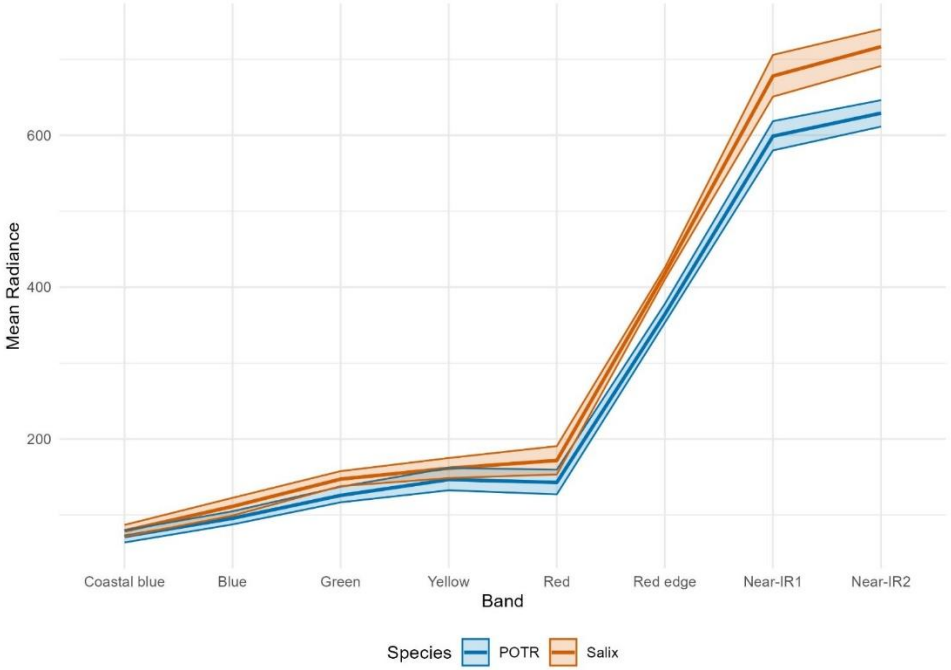

Figure 31. Surface radiance for POTR vs. Salix

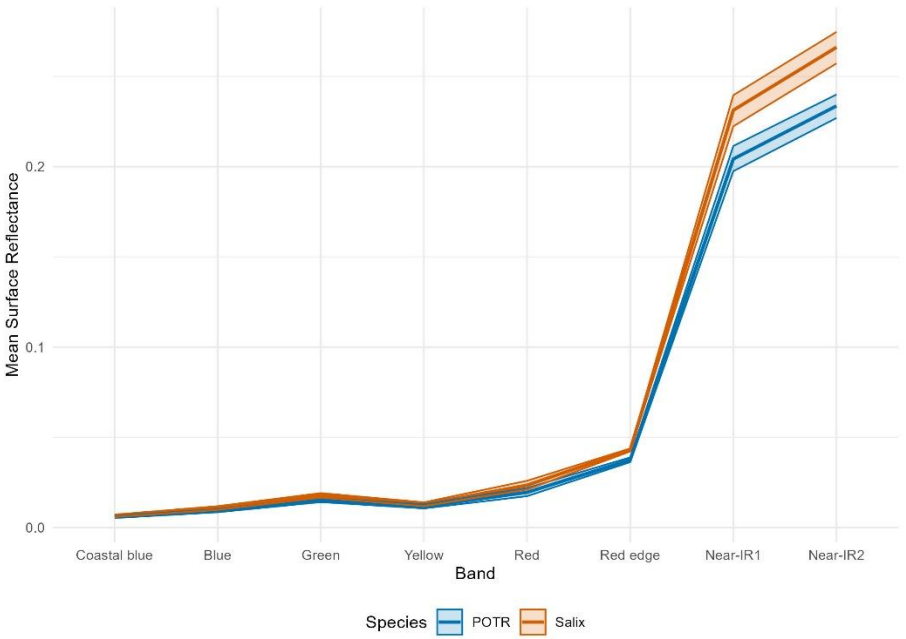

Figure 32. Surface reflectance for POTR vs. Salix

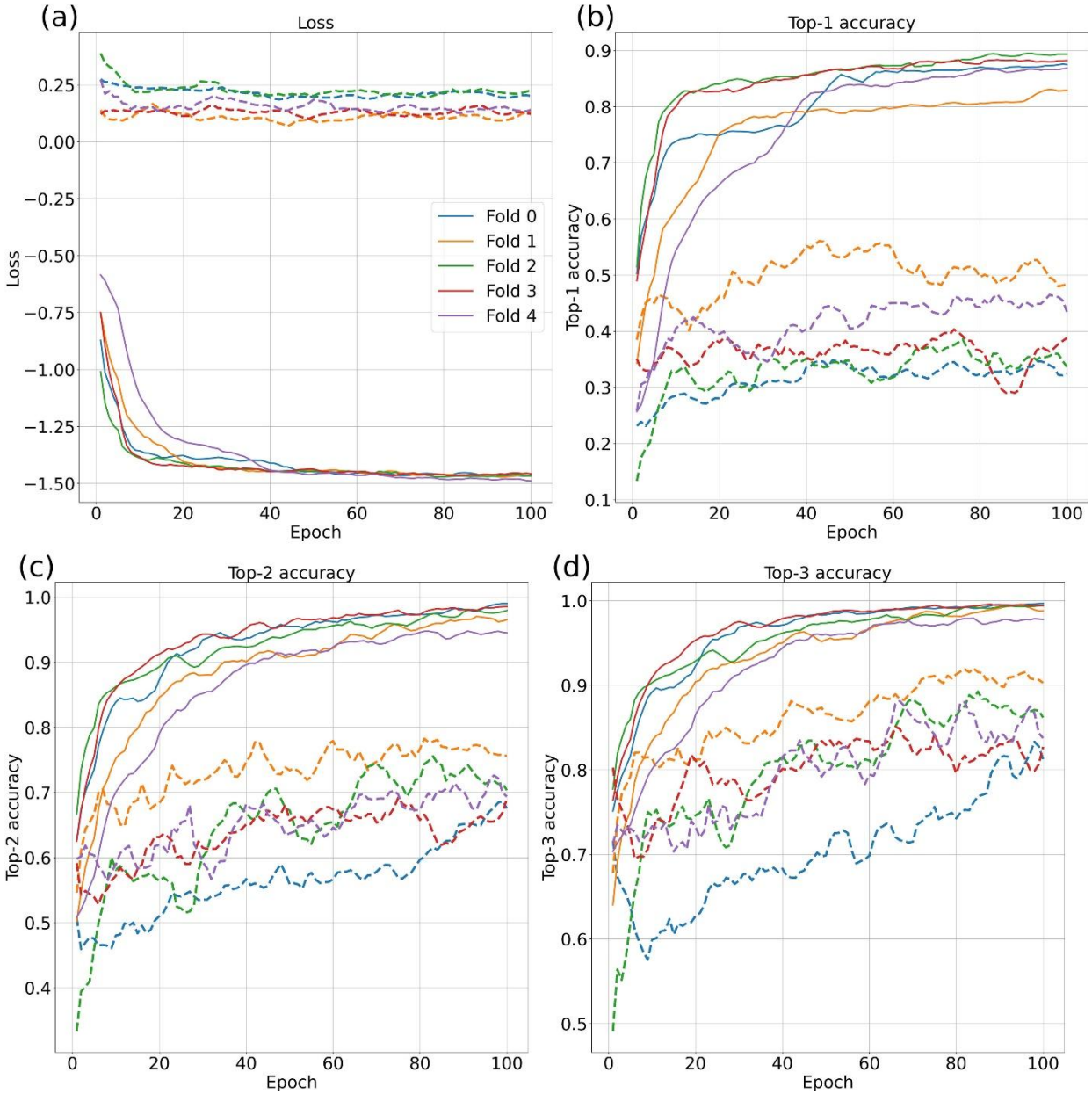

Figure 33. Learning curves for the six-class CNN model. Each panel shows the evolution of one performance metric over the 100 training epochs. Dashed (solid) lines represent the validation (training) data. Note that, because Keras expects the loss function to be negatively oriented (such that lower is better), the loss function here is actually the *negative* class-weighted Gerrity score.

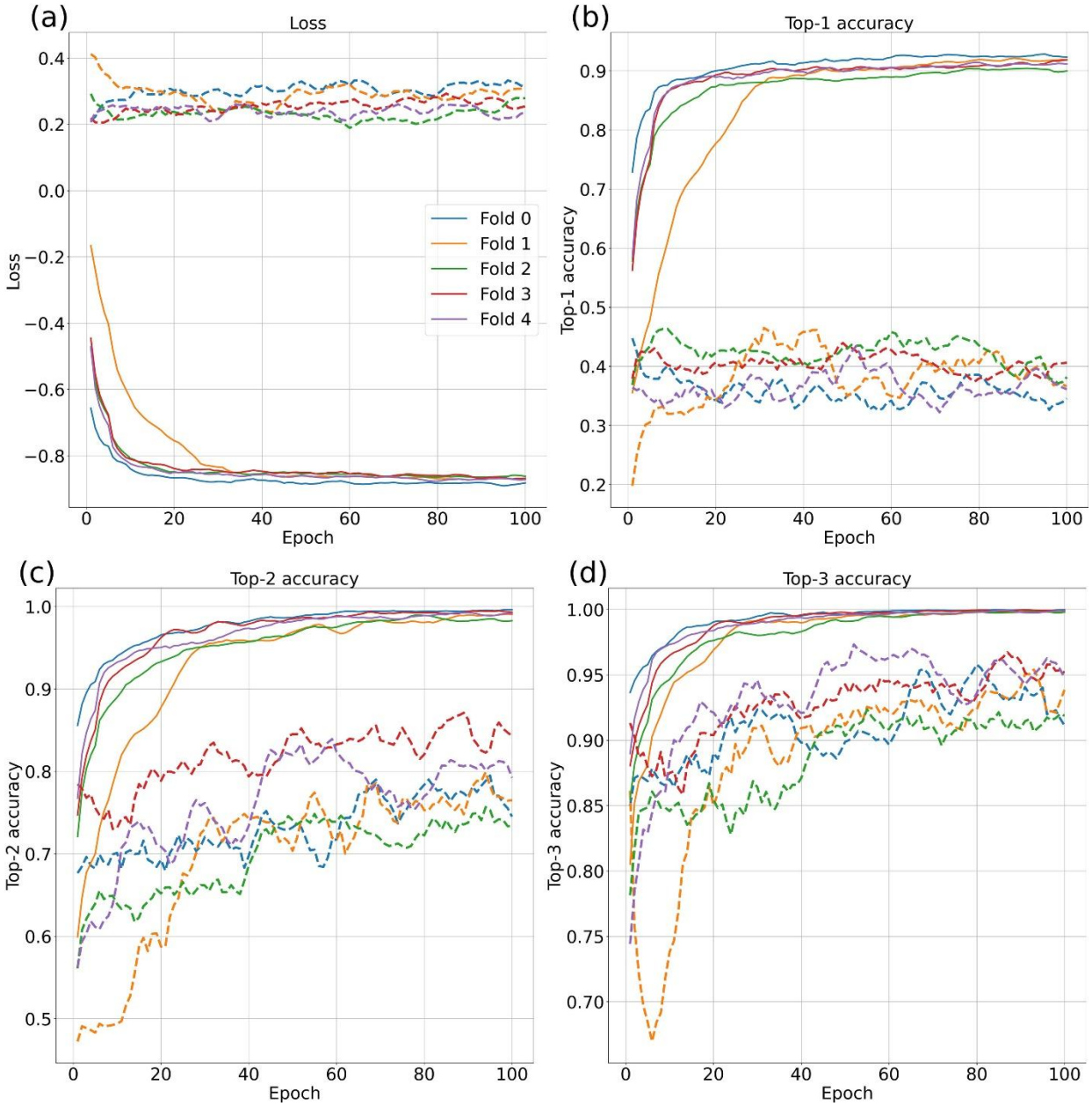
(a)
Loss
Loss
Epoch
Fold 0
Fold 1
Fold 2
Fold 3
Fold 4
(b)
Top-1 accuracy
Top-1 accuracy
Epoch
(c)
Top-2 accuracy
Top-2 accuracy
Epoch
(d)
Top-3 accuracy
Top-3 accuracy
Epoch

Figure 34. Learning curves for the four-class CNN model. Formatting is explained in the caption of Figure 33. Again, note that because Keras expects the loss function to be negatively oriented, the loss function here is actually the *negative* default Gerrity score.

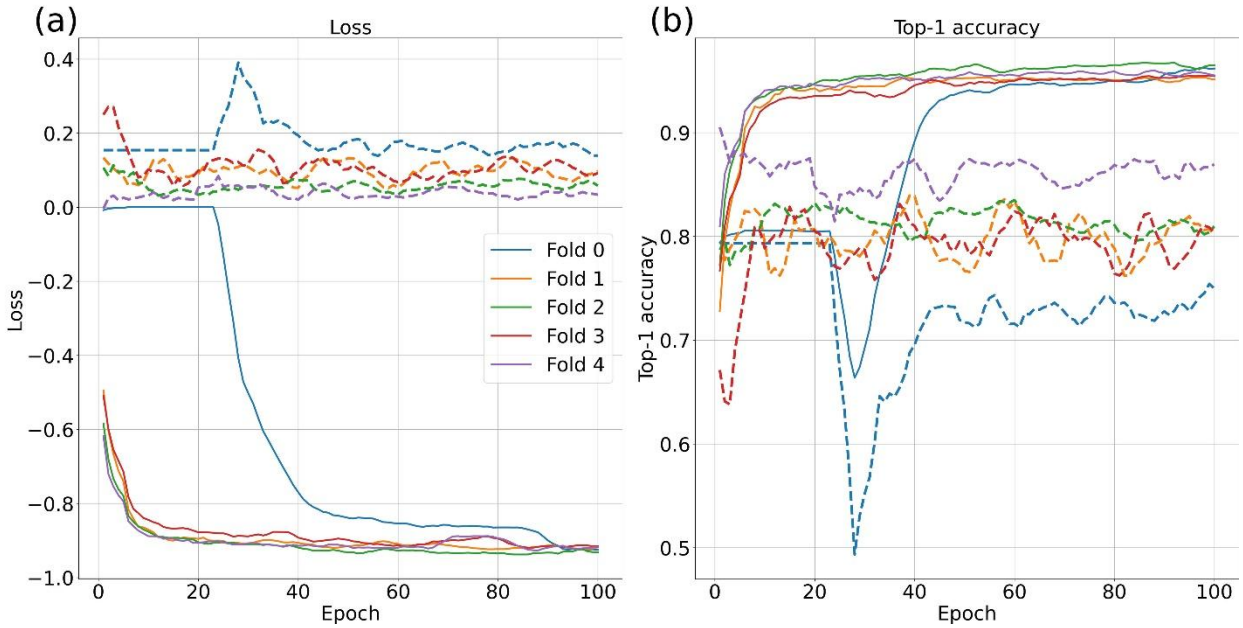

Figure 35. Learning curves for the two-class CNN model. Formatting is explained in the caption of Figure 33.

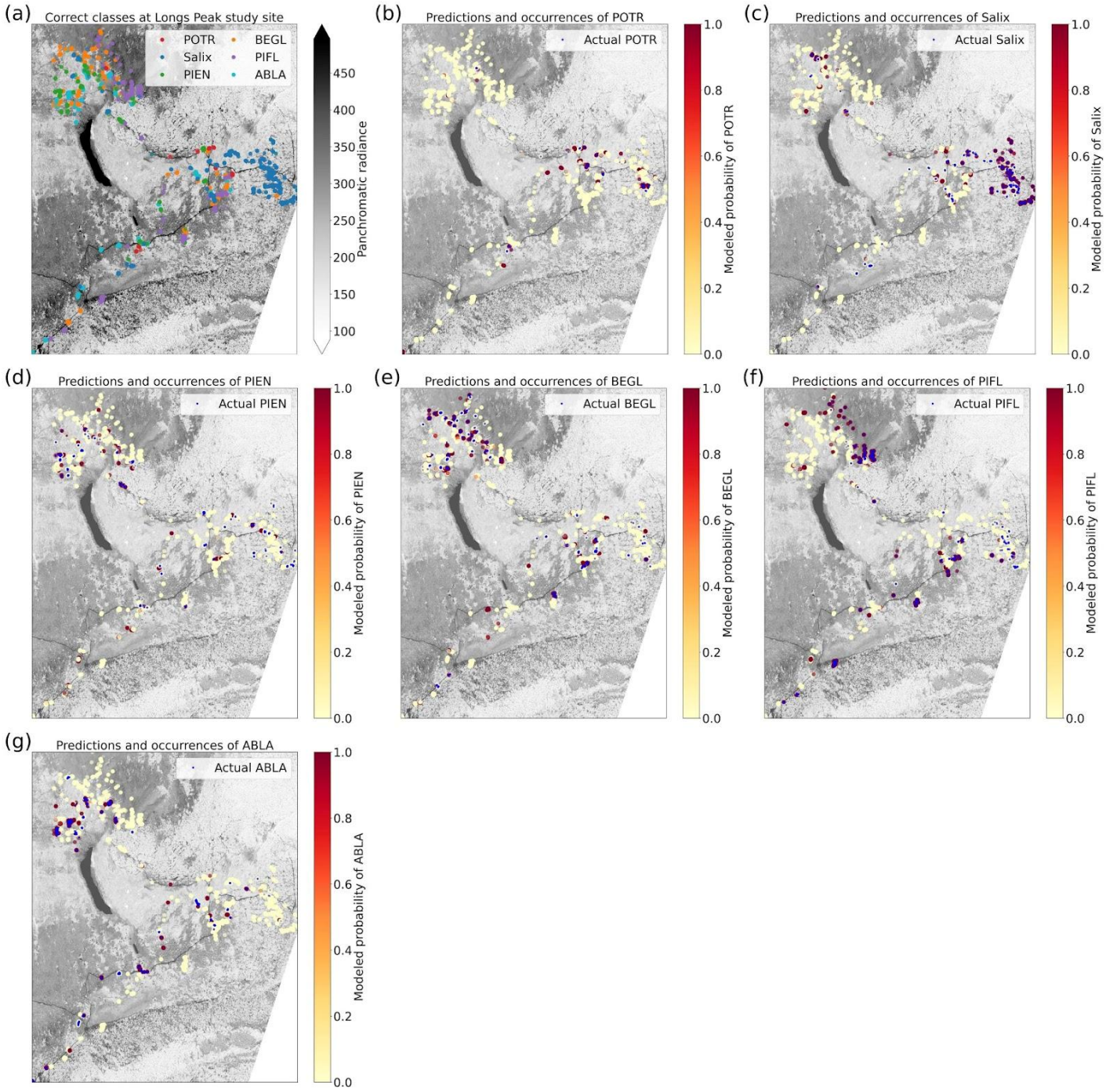
(a)
Correct classes at Longs Peak study site
POTR
Salix
PIEN
BEGL
PIFL
ABLA
Panchromatic radiance
450
400
350
300
250
200
150
100
(b)
Predictions and occurrences of POTR
Actual POTR
Modeled probability of POTR
(c)
Predictions and occurrences of Salix
Actual Salix
Modeled probability of Salix
(d)
Predictions and occurrences of PIEN
Actual PIEN
Modeled probability of PIEN
(e)
Predictions and occurrences of BEGL
Actual BEGL
Modeled probability of BEGL
(f)
Predictions and occurrences of PIFL
Actual PIFL
Modeled probability of PIFL
(g)
Predictions and occurrences of ABLA
Actual ABLA
Modeled probability of ABLA
1.0
0.8
0.6
0.4
0.2
0.0

Figure 36. Targets and out-of-bag predictions for the 6-class model at the Longs Peak study site. [a] Targets (actual classes) with panchromatic radiance (W m^{-2} sr^{-1} μm^{-1}) plotted in the background. Panchromatic radiance is plotted at quarter resolution (1.24 m instead of 0.31 m), due to memory limitations. [b] Out-of-bag predictions and actual occurrences of POTR. For each data sample (one data sample = one polygon pixel, as in Table 1), the yellow-to-red marker shows the modeled probability that the data sample is POTR, while the presence of a blue marker indicates that the sample is actually POTR. Hence, faint yellow markers (probability ~= 0) with no blue marker on top can be considered true negatives; faint yellow markers with a blue marker can be considered false negatives; dark red markers (probability ~= 1) with a blue marker can be considered true positives; and dark red markers with no blue markers can be considered false positives. [c] Same as panel b but for Salix. [d] Same but for PIEN. [e] Same but for BEGL. [f] Same but for PIFL. [g] Same but for ABLA.

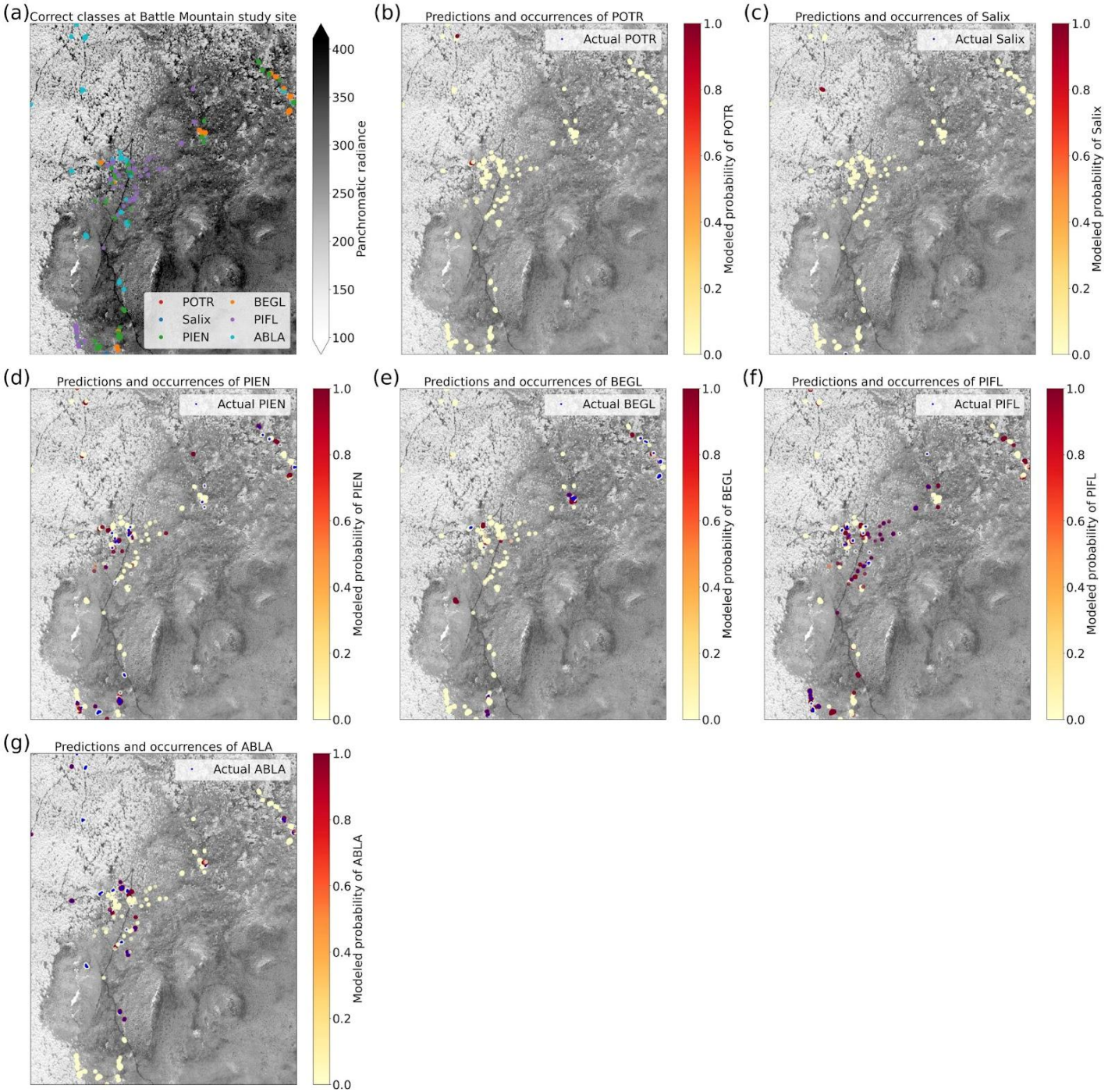
(a)
Correct classes at Battle Mountain study site
POTR
Salix
PIEN
BEGL
PIFL
ABLA
Panchromatic radiance
400
350
300
250
200
150
100
(b)
Predictions and occurrences of POTR
Actual POTR
Modeled probability of POTR
(c)
Predictions and occurrences of Salix
Actual Salix
Modeled probability of Salix
(d)
Predictions and occurrences of PIEN
Actual PIEN
Modeled probability of PIEN
(e)
Predictions and occurrences of BEGL
Actual BEGL
Modeled probability of BEGL
(f)
Predictions and occurrences of PIFL
Actual PIFL
Modeled probability of PIFL
(g)
Predictions and occurrences of ABLA
Actual ABLA
Modeled probability of ABLA
1.0
0.8
0.6
0.4
0.2
0.0

Figure 37. Targets and out-of-bag predictions for the 6-class model at the Battle Mountain study site. Formatting is explained in the caption of Figure 36.

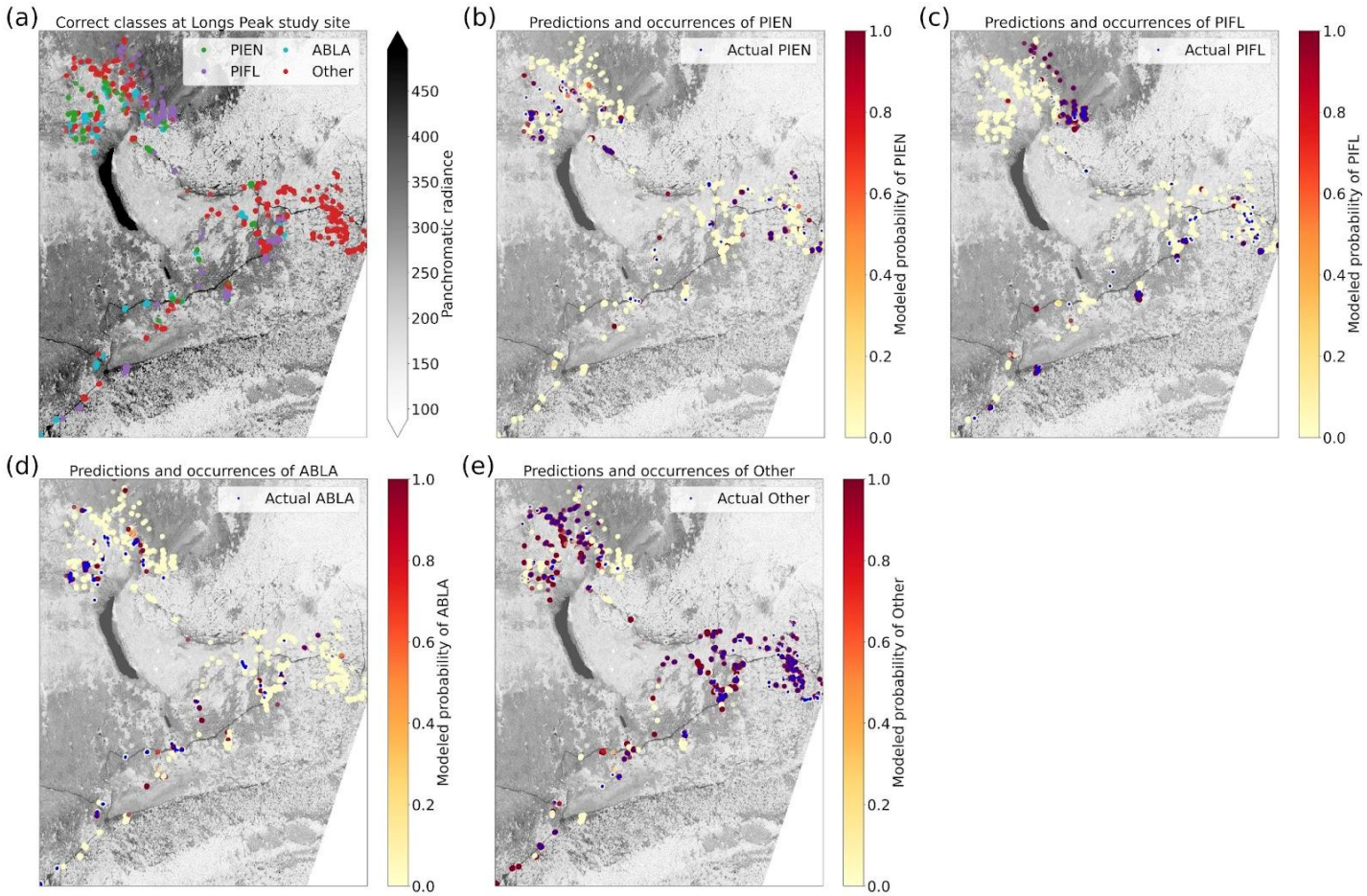

Figure 38. Targets and out-of-bag predictions for the 4-class model at the Longs Peak study site. Formatting is explained in the caption of Figure 36.

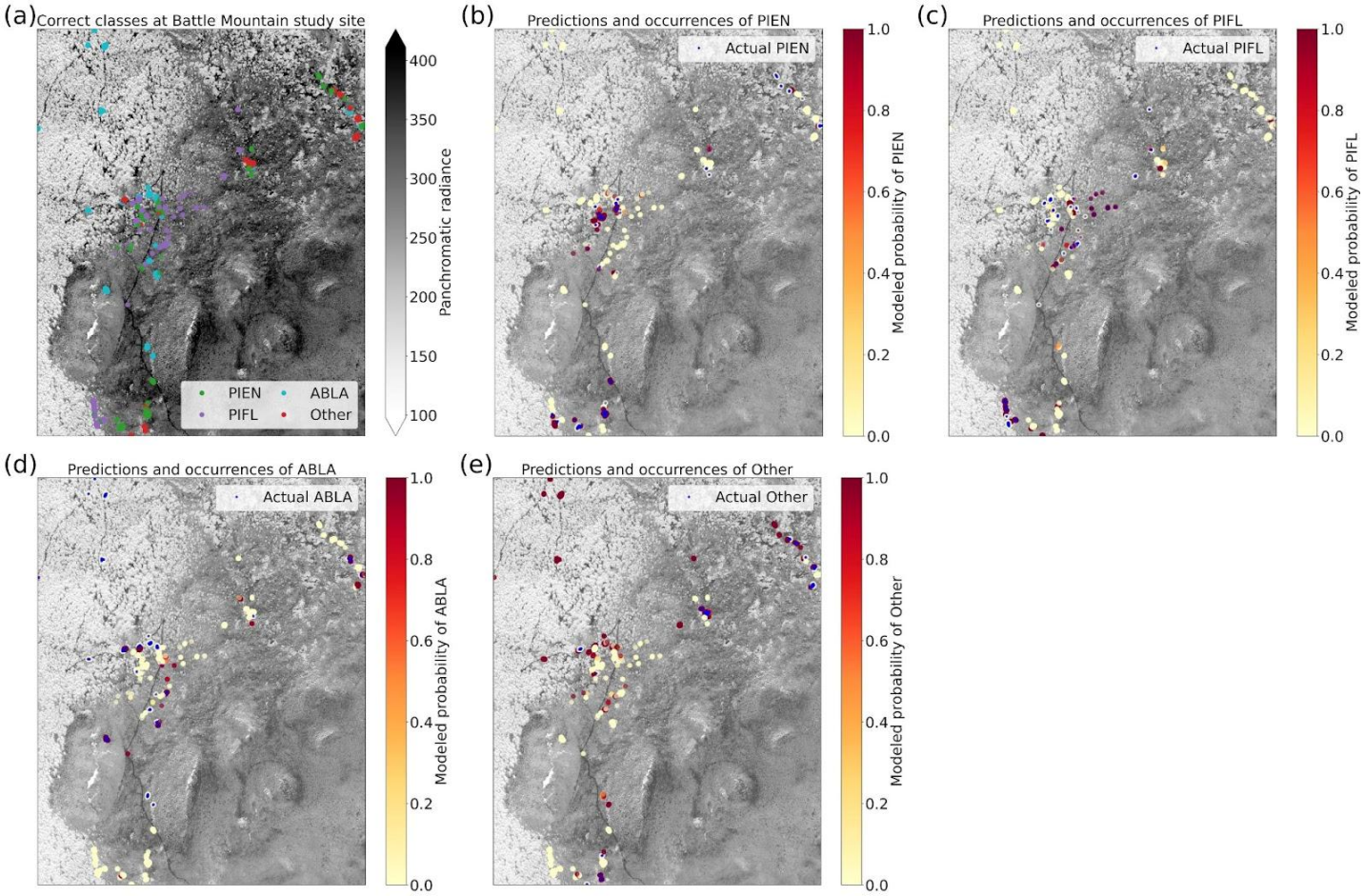

Figure 39: Targets and out-of-bag predictions for the 4-class model at the Battle Mountain study site. Formatting is explained in the caption of Figure 36.

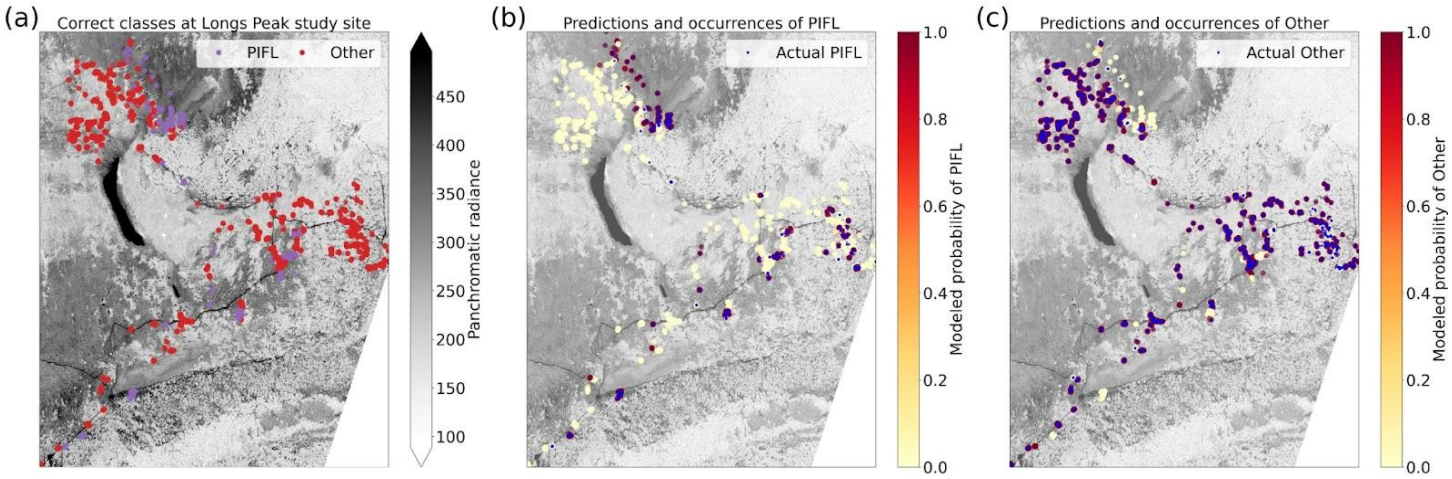

Figure 40: Targets and out-of-bag predictions for the 2-class model at the Longs Peak study site. Formatting is explained in the caption of Figure 36.

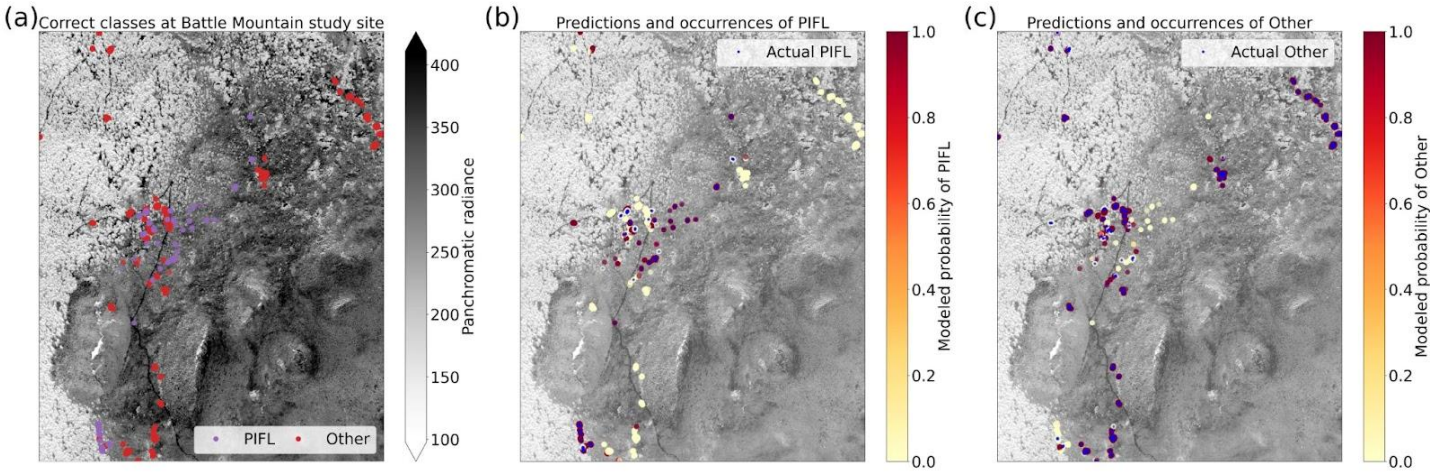

Figure 41: Targets and out-of-bag predictions for the 2-class model at the Battle Mountain study site. Formatting is explained in the caption of Figure 36.