黑白寫眞上의 樹種識別

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Photo-Interpretation and Identification of Three Species on Panchromatic Film

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Summary

Conclusion

The results of this study are encouraging for the development of a set of interpretable diagnostic criteria for a reasonably reliable identification of some species.

The present study has been limited in the characteristics studied and was made on relatively poor photography. Further study on high quality photography, over wider areas and including such additional characteristics as crown texture and shadow intensity should prove useful.

A preliminary examination has been made of some photo-image characteristics of a number of important tree species on large scale (1:9,000) contact prints of panchromatic film. The characteristics studied were crown image tone, and shape. Image tone was estimated against a standard grey-scale and shows within-species consistency and a range between species. Crown shapes were subjectively assessed but there appears to be a within-species consistency and interpretable between-species differences.

The results of this trial suggest that it should be practicable to make a number of important species distinctions by photo-interpretation with a useful degree of reliability. Other characteristics beside those studied might be usefully examined.

Photography

Hand-printed glossy contact prints of vertical 1:9,000 scale panchromatic photography of Kwangnung Experimental Forest flown May 1964. The filter used is unknown (probably minus-blue). The camera is unknown but was probably a military type K-17 or K-22 with 6" (apostrophy) lens. The photography shows notably poor resolution.

Species

143 individual trees ranging through 11 species (7 softwood, 4 hardwood) were included in the study. A range of size classes were included for each species.

Species	Number studied
Softwoods	
Abies holophylla	17
Larix leptolepis	19
Pinus banksiana	6
P. densiflora	20
P. koraiensis	15
P. rigida	18
P. strobus	6
Hardwoods	
Alnus japonica	11
Carpinus laxiflora	10
Quercus aliena	14
Q. serata	11

Individual dominant and co-dominant trees were located in the field and pin-pointed on the photographs for later study in the office.

Image Tone

Grey-scale: A grey-scale was used for tone comparison. An original grey-scale was made up with processed unexposed negative film assembled in step-fashion so as to range from 1 by steps to 10 film thicknesses. This was then used as a negative to print a standard grey-scale ranging from white (greyness grade = 10) to black (= 1).

Tone-grading: Each tree crown image was graded by comparison with the grey-scale. This grading was made independently by 14 interpreters. The tone was referred to the sunlit portion of the crown.

Interpreter differences: Obviously the degree of "consistency" between individual interpreter would indicate the "objectivity" and hence the "validity" of the tone grading.

A rough examination of this aspect shows that the measure is quite satisfactorily "valid".

The range in the recorded tone grades for any one image in most cases was 2 units (e.g. minimum 5 to maximum 7); in a few cases the range was 3 units.

The absolute difference between individual grade values and the mean of all (14) observed values for the image was calculated. The overall mean difference (between observed value and mean tone value) was less than 0.5 of a tone grade.

The sums of all differences (regardless of a sign) for each interpreters show that only one or two interpreters depart more markedly from average than the rest.

Tone and Species: Mean tone grades for individual trees were grouped by species and by size class. The overall mean and standard deviation for species was calculated and these figures were used to plot a series of "normal tone distribution" curves for the species.

These curves are given in Diagram.1. It can be seen that the tones fall into three or four groups with more or less overlap. There is a clear softwood – hardwood distinction with some further, probably useful, distinction within these groups. The average tone for *Alnus japonica* is interestingly intermediate between the softwoods and the other hardwoods and extends widely into the ranges for each broad group.

It is interesting too that some species appear to spread over a wider tone range than others.

Tone and Size: Average tone grades within species show a tendency towards increasing tone (darkness) with increase of tree size. There are insufficient samples to make a proper study of this aspect.

Crown Shape and Margin

A circle was assumed as the fundamental crown shape in plan (1.3. as seen from above) and an attempt was made to describe the typical shape of each species in terms of the degree of departure of the margin from a smooth circle.

On the samples studied the typical shape was classified as follows:

Crown Margin	Species
Smoothly circular	*Abies holophylla*
	Larix leptolepis
	Pinus koraiensis
Slightly ragged	*P. banksiana*
	P. densiflora
	P. rigida
	P. strobus
Scalloped	*Alnus japonica*
	Quercus aliena
	Q. serata
Irregular	*Carpinus koreana*

Vertical Shape (Silhouette)

To a considerable extent, on large-scale photography, the "vertical" shape of a crown can be identified and this may be more or less characteristic of a species. The species studied may be grouped as follows:

Silhouette	Species
Concial, peaked	*Abies holophylla*
	Larix leptolepis
Conical, rounded	*Pinus (all species)*
Spherical	*Alnus japonica*
Umberageous	*Carpinus koreana*
	Quercus aliena
	Q. serata

IMAGE TONE GRADE BY SPECIES

Panchromatic photography, Kwangnung Experimental Forest

Diagram 1

Symbol	Species	Tone mean	Grade s.d.
A	*Pinus koraiensis*	4.69	0.54
B	*P. densiflora*	5.22	0.34
C	*P. rigida*	5.12	0.44
D	*P. banksiana*	4.76	0.05
E	*P. strobus*	5.05	0.08
F	*Abies holophylla*	4.59	0.41
G	*Larix kaempferi*	5.12	0.42
H	*Aluns japoncia*	5.93	0.56
I	*Quercus aliena*	7.38	0.39
J	*Q. serata*	7.14	0.64
K	*Carpinus laxiflora*	6.69	0.22