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TECHNICAL MEMORANDUM

EXAMPLES OF PHASE III OMISSION LABELING ERRORS

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16. Abstract

The most frequent omission labeling errors from each of five U.S. Great Plains states (Colorado, Montana, Minnesota, North Dakota, and Oklahoma) are presented through imagery acquisitions that represent the signatures applicable to the growth stages of the small grain. The causes of each error applied to the temporal sequence of signatures are briefly explained. The most frequent omission error of all five states is the border/edge element. Other frequent errors are abnormal small-grain signatures and estimates made without sufficient representations of necessary growth stages of small grains.

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INTRODUCTION

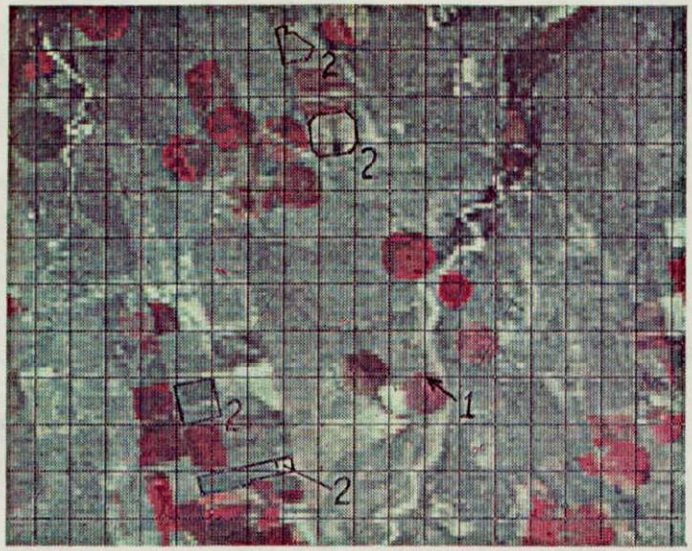
One of the major sources of underestimation in the proportion estimates acquired during the Large Area Crop Inventory Experiment (LACIE) has been found to be the misidentification of small-grain signatures. Documentation of the most frequent errors for each state is therefore considered appropriate. A series of Product 1 imagery processed by the production film converter is used to demonstrate the problems encountered by the analyst in interpreting the temporal changes of signatures in relation to the growth stages of small grains.

The most frequent errors for each state were selected by using data from a labeling error study (ref. 1) of blind site segments for five U.S. Great Plains states (Colorado, Montana, Minnesota, North Dakota, and Oklahoma). The segments containing the highest number of the most frequent errors for its state were selected and are used for this documentation unless the contrast in the imagery of the signature was too low to make the example easily visible. In that case, another segment was chosen for the display.

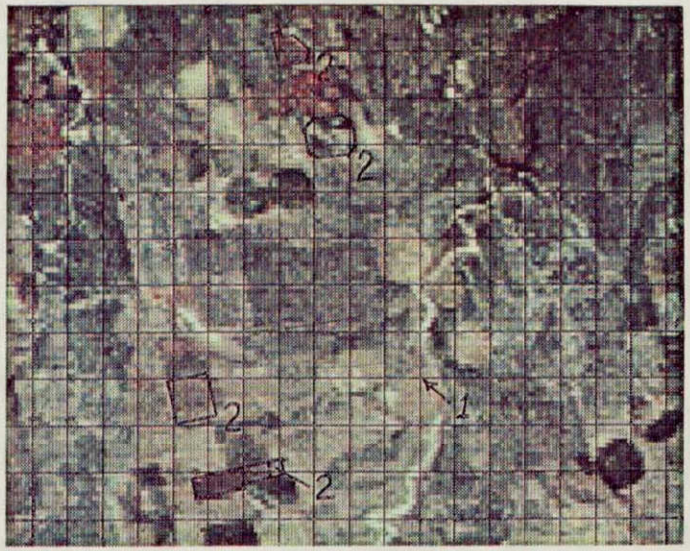
RESULTS

The results of the selection are listed in the following table, and the examples are presented in figures 1 to 6. The order of the causes in the examples for each state does not always place the most frequent error first.

State	County	Segment number	Error cause	Applicable figure
Colo.	Kit Carson	1008	1. Edge pixel 2. Signature behind adjusted crop calendar	1
Minn.	Grant	1521	1. Border pixel 2. Edge pixel 3. Abnormal signature	2
Mont.	Hill	1737	1. Edge pixel 2. Border pixel	3
	Fergus	1948	1. Abnormal signature	4
N. Dak.	Stark	1652	1. Integrated signature 2. Edge pixel 3. Border pixel 4. Abnormal signature	5
Okla.	Garfield	1365	1. Insufficient acquisitions	6



(a) Planting stage (imagery taken on September 11, 1976).

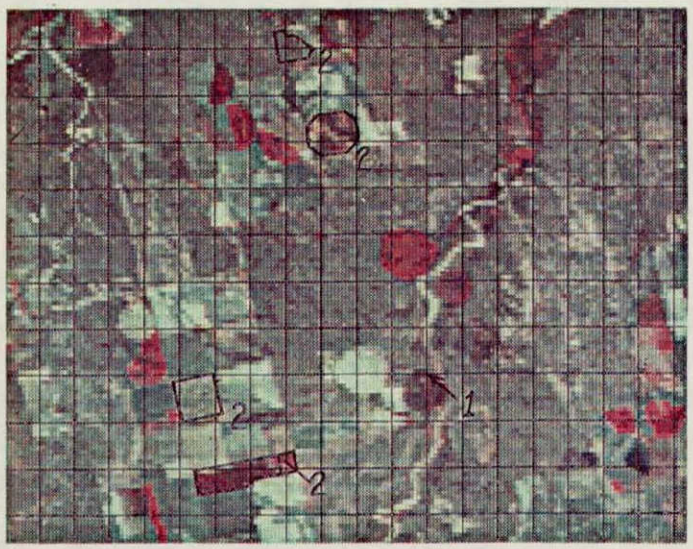


(b) Postemergence stage (imagery taken on March 10, 1977).

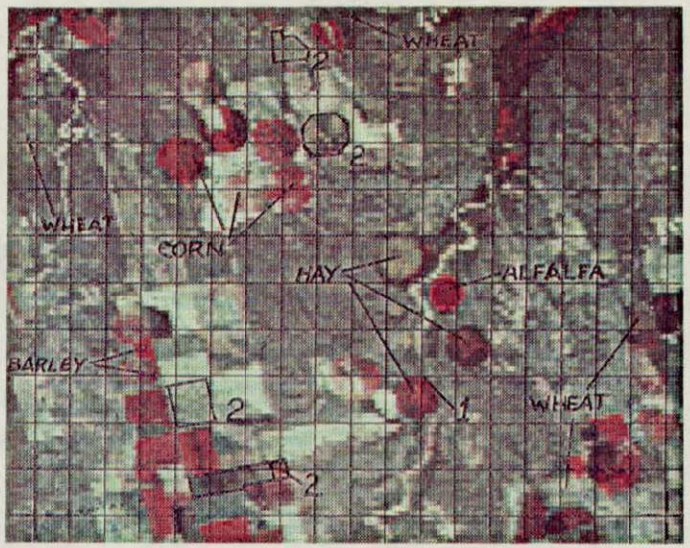
1. Edge pixel — Shifts from circular wheat field (tillering/heading) to pasture signature (turning).

2. Signature behind ACC — Temporal signature for wheat development of the field is behind the expected signature of the adjusted crop calendar (ACC) for the majority of wheat fields.

Figure 1.— Phase III omission labeling error examples for Kit Carson County, Colorado (segment 1008).



(c) Tillering/heading stage (imagery taken on June 8, 1977).

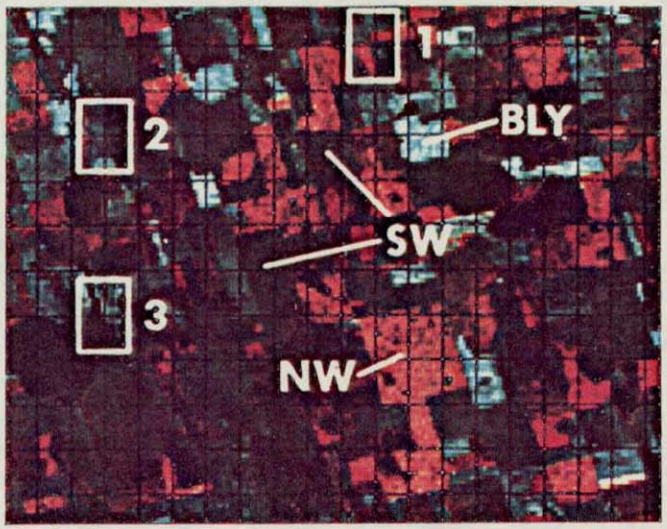


(d) Turning stage (imagery taken on June 26, 1977).

The small-grain signature for an ACC allows some latitude of variability of colors. The signatures will range from those somewhat behind to those somewhat ahead of the expected color of the ACC as shown in the identified wheat fields.

Figure 1.– Concluded.

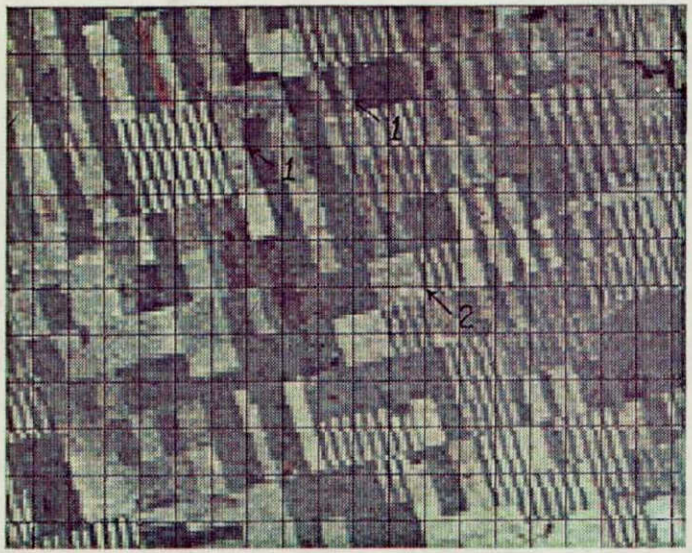
(a) Heading stage (imagery taken on June 23, 1977). Red is spring wheat; green is nonwheat.



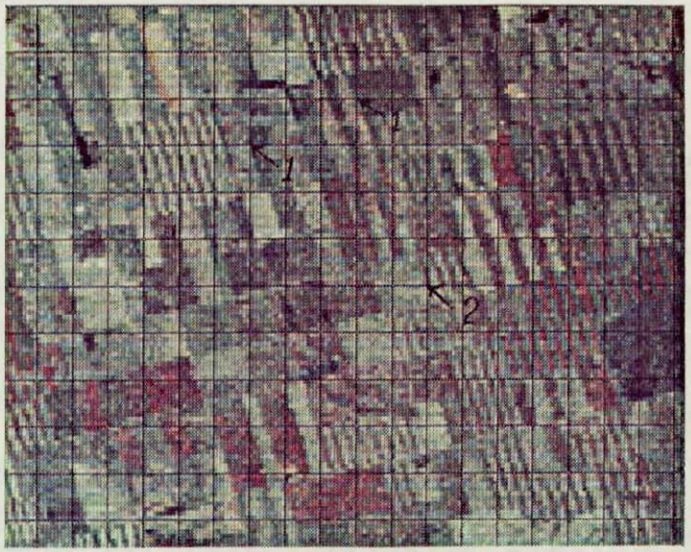
(b) Turning stage (imagery taken on July 29, 1977). Green is spring wheat; red is nonwheat.

1. Border pixel — Spectral confusion of spring wheat and sunflowers.
2. Edge pixel — Shifts from road (heading) to spring wheat (turning).
3. Abnormal signature — Excess water retarded spring wheat's development.

Figure 2.— Phase III omission labeling error examples for Grant County, Minnesota (segment 1521).



(a) Planting stage (imagery taken on October 7, 1976).



(b) Tillering/heading stage (imagery taken on April 23, 1977).

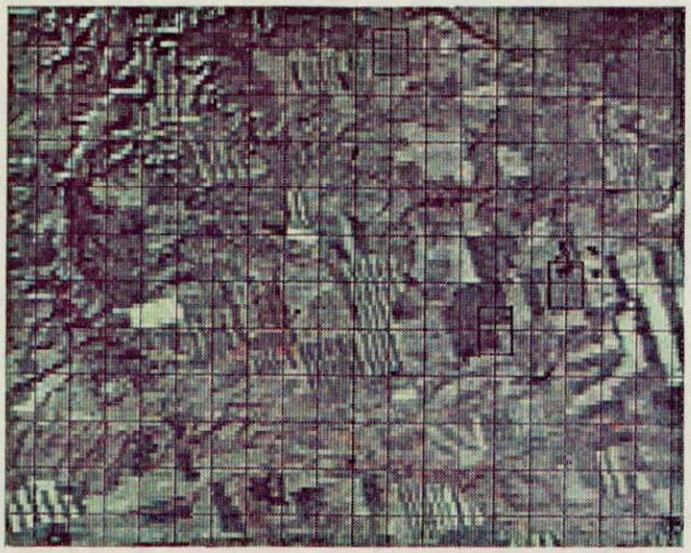
1. Edge pixels — Shift from one field to another, especially on narrow fields within the limits of accepted registration.

2. Border pixel — Spectral and spatial confusion of adjacent signatures.

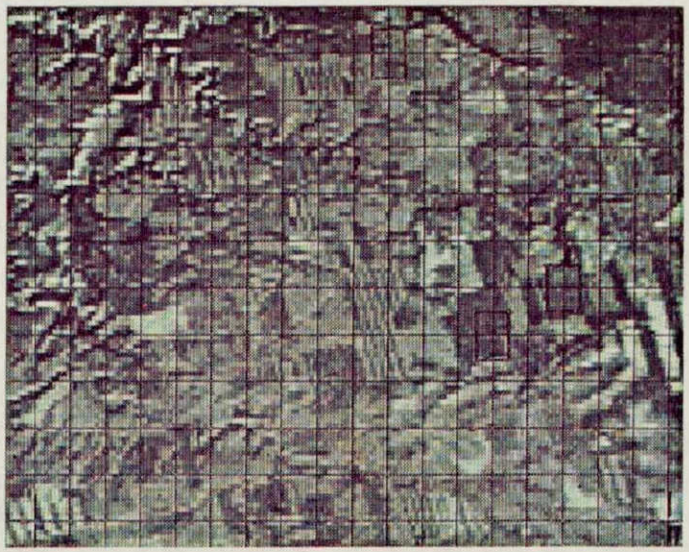
Figure 3.— Phase III omission labeling error examples for Hill County, Montana (segment 1737).

(c) Turning stage (imagery taken on July 22, 1977).

Figure 3.— Concluded.



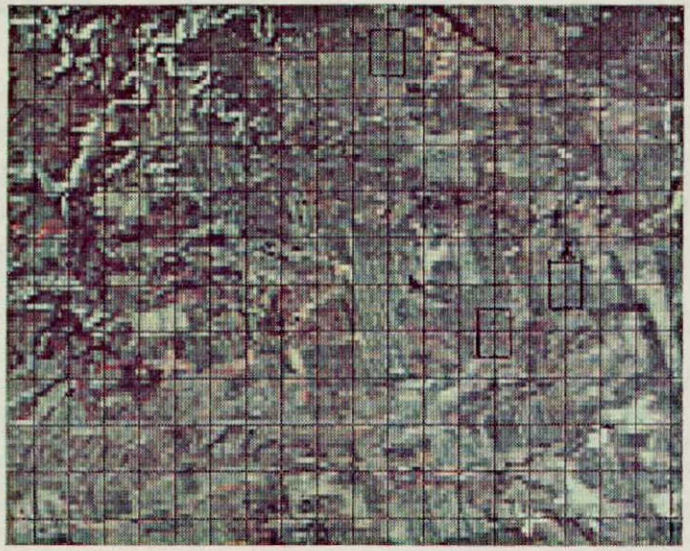
(a) Planting stage in winter (imagery taken on October 6, 1976).



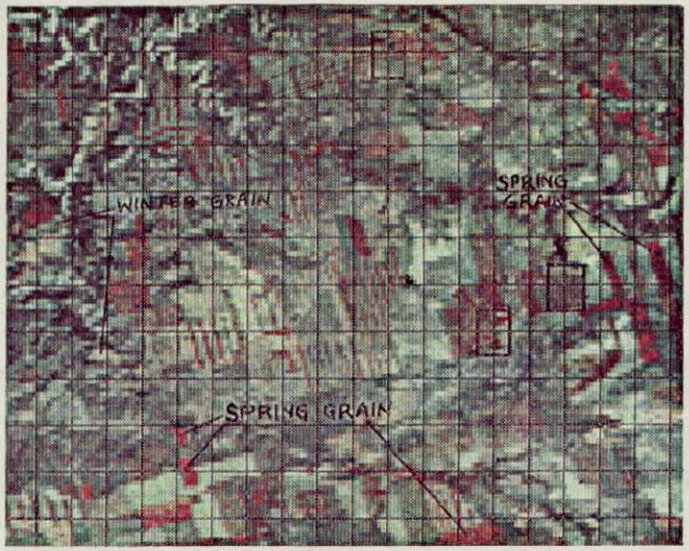
(b) Early emergence stage in winter (imagery taken on November 11, 1976).

Abnormal signature — Winter wheat signature does not follow the winter wheat temporal color sequence. The winter wheat signature development is behind the winter grain temporal color sequence. It is coincident with the spring grain temporal color sequence; therefore, winter wheat is confused with spring grains.

Figure 4.— Phase III omission labeling error examples for Fergus, Montana (segment 1948).

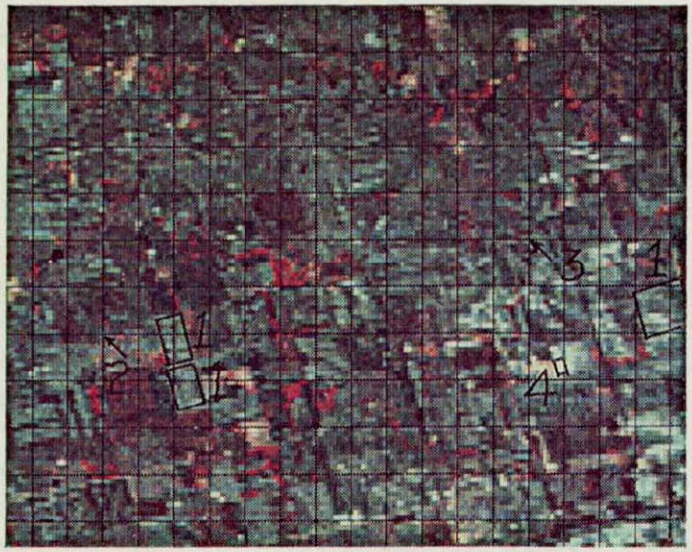


(c) Tillering/heading stage in winter (imagery taken on April 22, 1977).

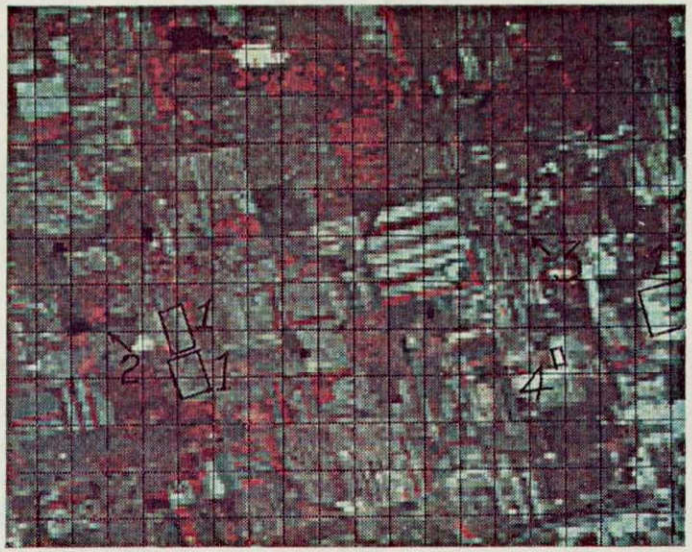


(d) Turning stage in winter (imagery taken on July 3, 1977).

Figure 4.– Concluded.



(a) Planting stage (imagery taken on May 5, 1977).



(b) Early emergence stage (imagery taken on June 28, 1977).

1. Integrated signature — Wheat and fallow signatures blended.
2. Edge pixel — Shifts from pasture (early emergence, heading) to wheat (turning).

Figure 5.— Phase III omission labeling error examples for Stark County, North Dakota (segment 1652).

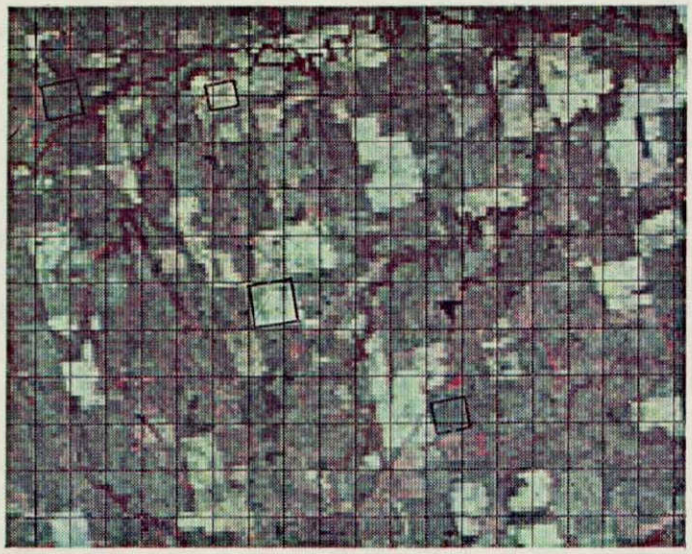
(c) Tillering/heading stage (imagery taken on July 16, 1977).

(d) Turning/harvest stage (imagery taken on August 21, 1977).

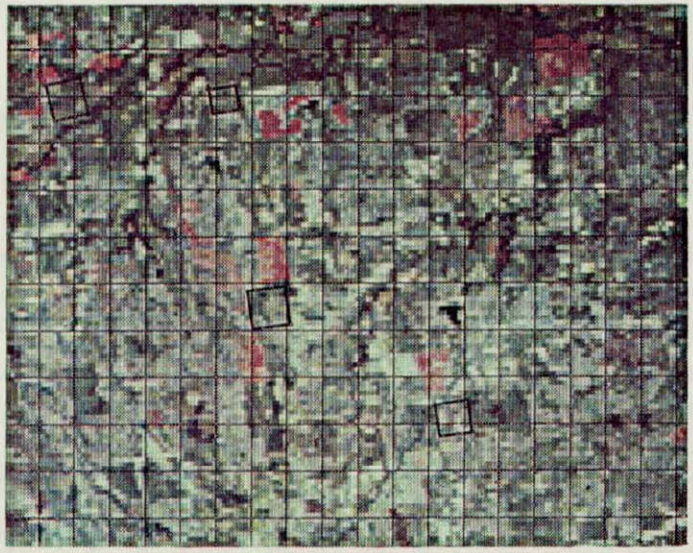
3. Border pixel — Spectral and spatial confusion of wheat and fallow (turning/harvest).

4. Abnormal signature — Wheat field's temporal signature does not follow temporal color sequence of wheat.

Figure 5.— Concluded.



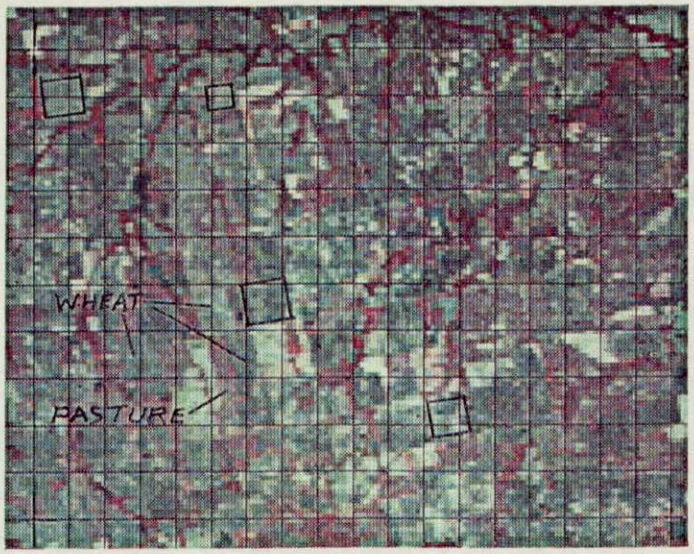
(a) Planting/emergence stage (imagery taken on October 13, 1976).



(b) Dormancy stage (imagery taken on November 18, 1976).

The error cause is insufficient acquisitions. Critical growth stages of wheat temporal color sequence are missing. Optimal growth stage interpretation requires a combination of acquisitions that represent early emergence, tillering/heading, and turning/harvest. The requirement for these critical growth stage representatives has been included in the acreage estimates for post-Phase III tasks.

Figure 6.— Phase III omission labeling error examples for Garfield County, Oklahoma (segment 1365).



(c) Turning/harvest stage (imagery taken on June 4, 1977).

Figure 6.— Concluded.

It is hoped that these imagery examples will be useful to image interpreters and to managers of future crop acreage estimation projects; to the former so that they can be more aware of the problems they may encounter and to the latter so that they can provide direction to help eliminate technical problems facing analysts. For example, the border/edge pixels might be labeled only as such and statistically handled in the estimation through the computer.

REFERENCE

1. Phase III Labeling Error Characterization: Final Report. LEC-13012, (JSC-14745), Mar. 1979.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