Lightning Talk: Understanding Error Matrices (Accuracy Assessment)

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Importance of Accuracy Assessments

Accuracy assessments are essential parts of all modeling exercises, remote sensing or otherwise.

- They allow users to compare different approaches
- They provide information on the reliability and usefulness of techniques
- They support the use of outputs for decision-making

Site vs. Non-Site Specific Accuracy

Non-Site

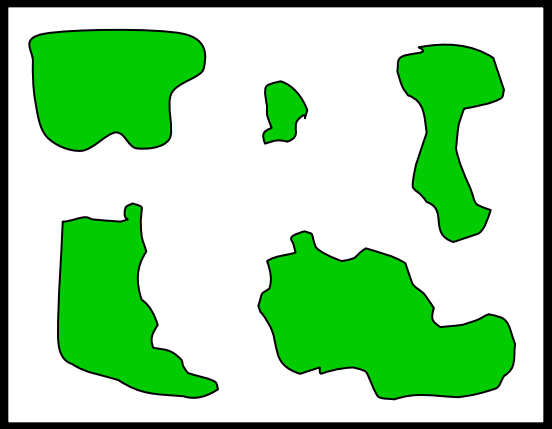
- No locational component
- Total acreage by category comparison between a change map and some reference data (e.g. FIA data)

Site

- Locational/Spatial component
- Use of error matrix to represent errors of omission and commission of change (spatial error)

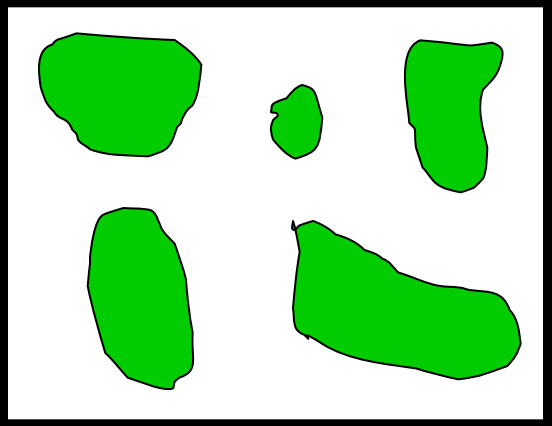
Non-Site Specific Accuracy

Reference Data



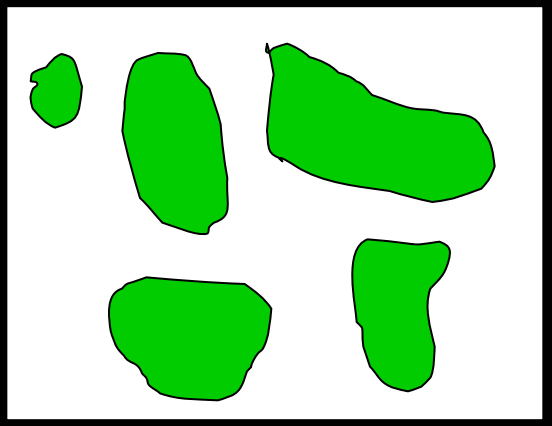
Change = 1,000 acres

Classified Image #1



Change = 1,200 acres

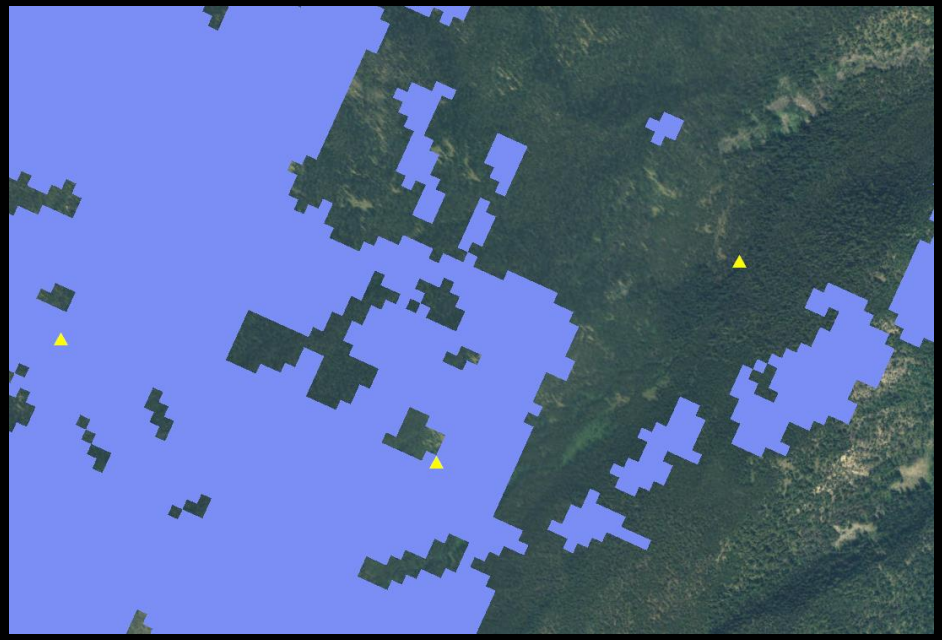
Classified Image #2



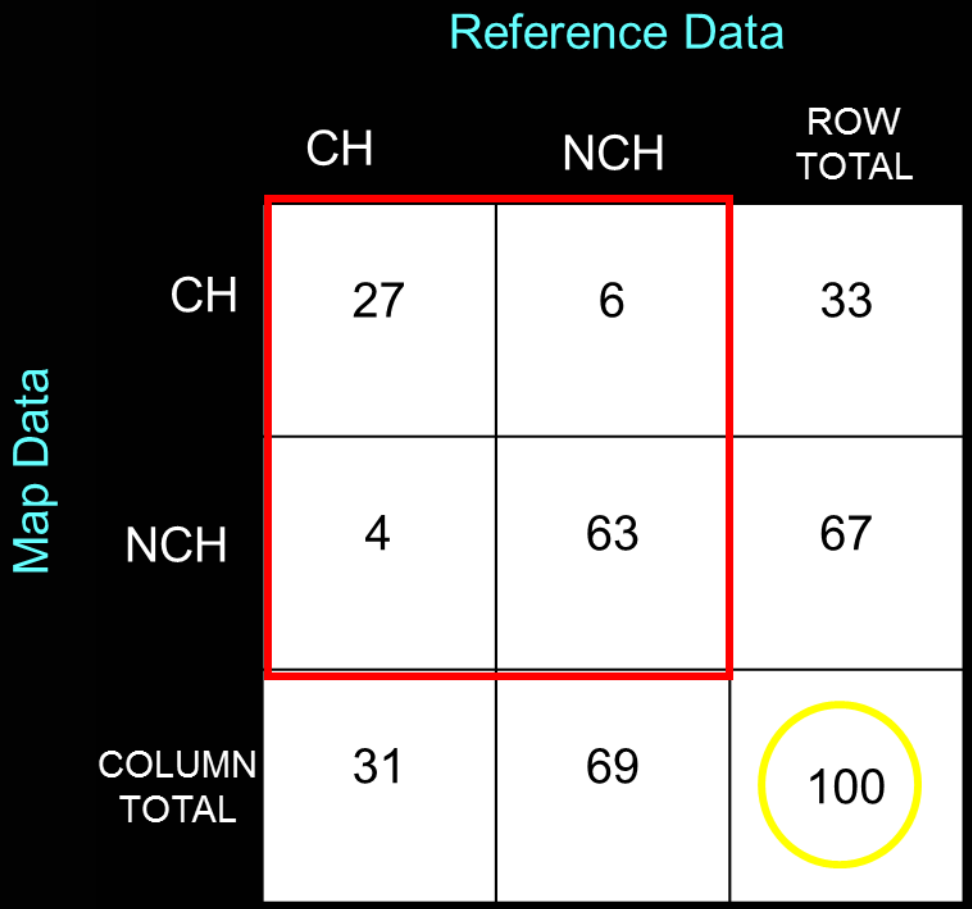
Change = 1,200 acres

Site Specific Accuracy

Boise-Payette NF – Forest disturbance



Change Map- Error Matrix



CH = Changed

NCH = Not Changed

Change Map- Error Matrix

Diagonals represent sites that were correctly classified

Map Data \ Reference Data	CH	NCH	ROW TOTAL
CH	27	6	33
NCH	4	63	67
COLUMN TOTAL	31	69	100

CH = Changed

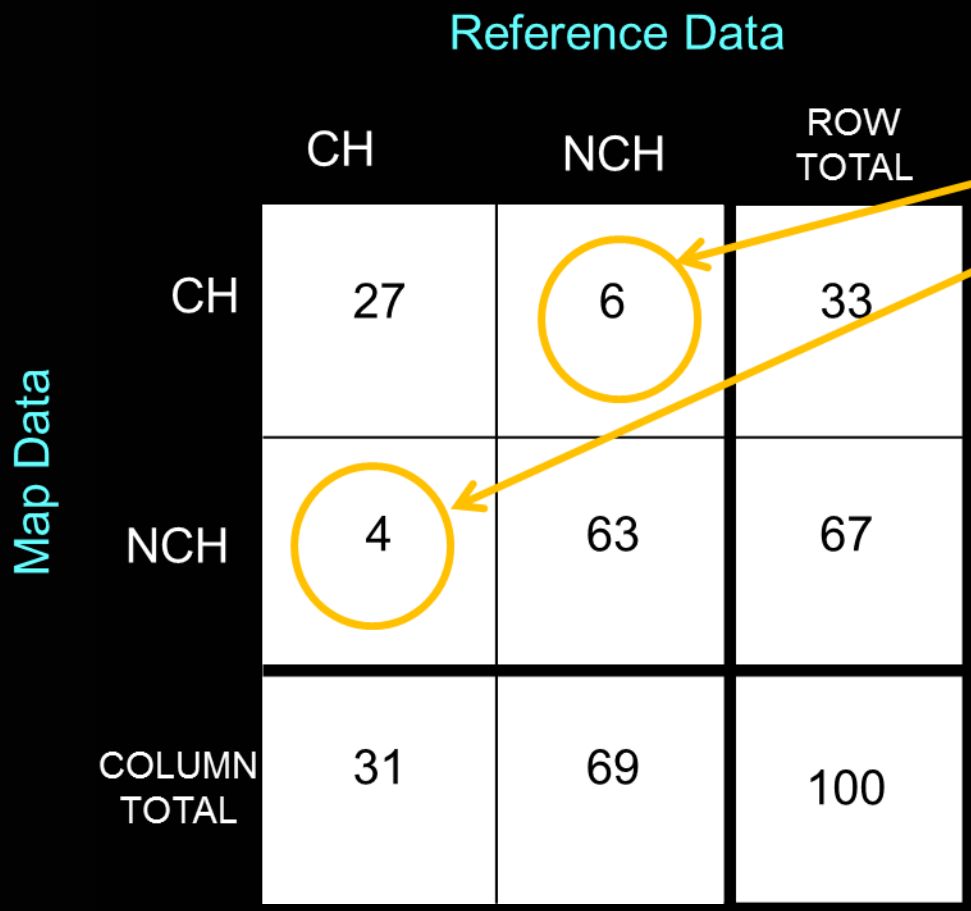
NCH = Not Changed

Overall Accuracy =
27 + 63 = 90

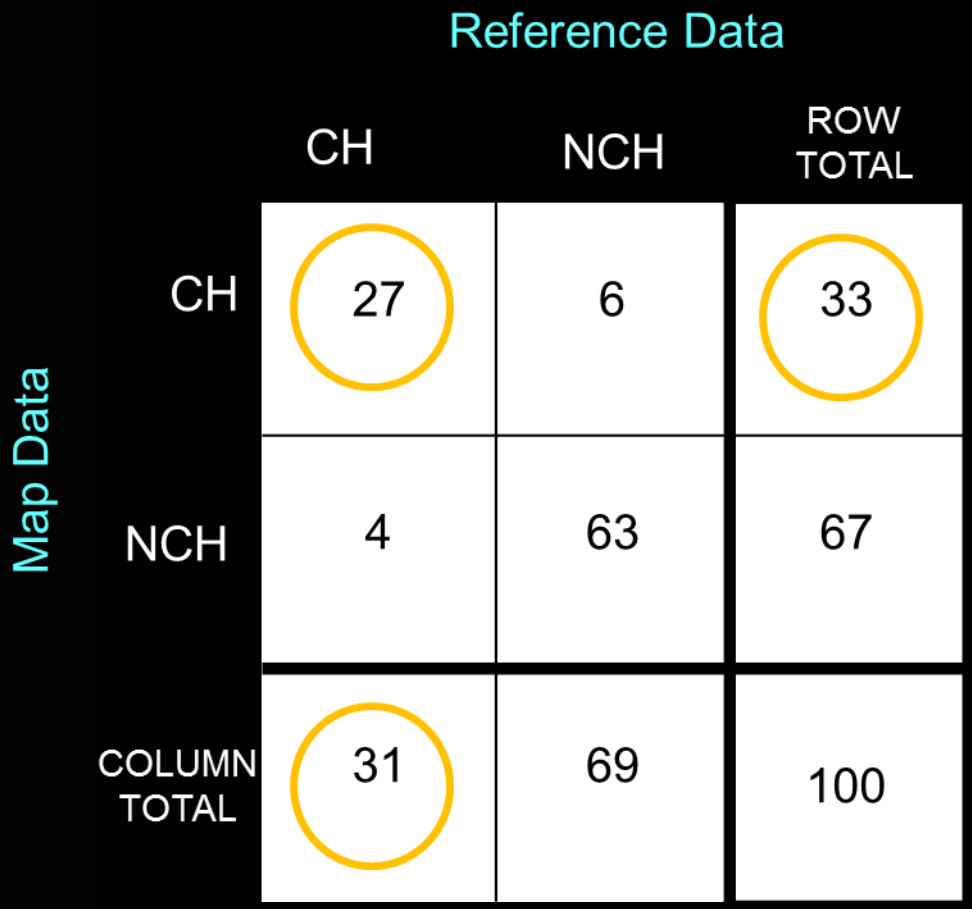
90/100 * 100 = 90%

Change Map- Error Matrix

The off diagonals represent sites that were misclassified according to the reference data



Change Map- Error Matrix



Individual Class Accuracy is given by the diagonal value divided by the row or column total.

Change:
27/33 * 100 = 82%
or
Change:
27/31 * 100 = 87%

But, how can there be two values and what do they mean… ?

Measures of Accuracy

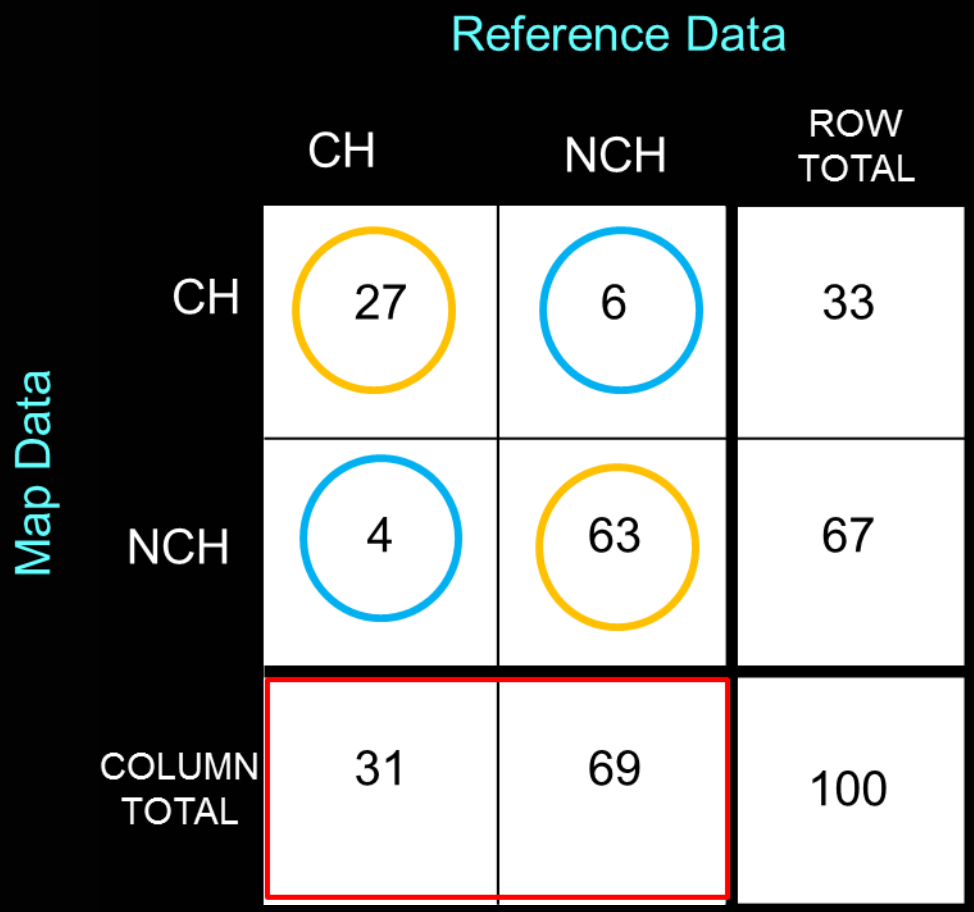
Producer's Accuracy

- The percentage of time a class identified on the ground is classified into the same category on the map.
- Omission – When change is classified as non-change.

User's Accuracy

- The percentage of time a class identified on the map is classified into the same category on the ground.
- Commission – When non-change is classified as change.

Change Map- Error Matrix



Producer's accuracy

Change:

27/31 * 100 = 87%

Non-change:

63/69 * 100 = 91%

This tells the producer that there is an 87% chance of mapping change correctly.

Errors of Omission

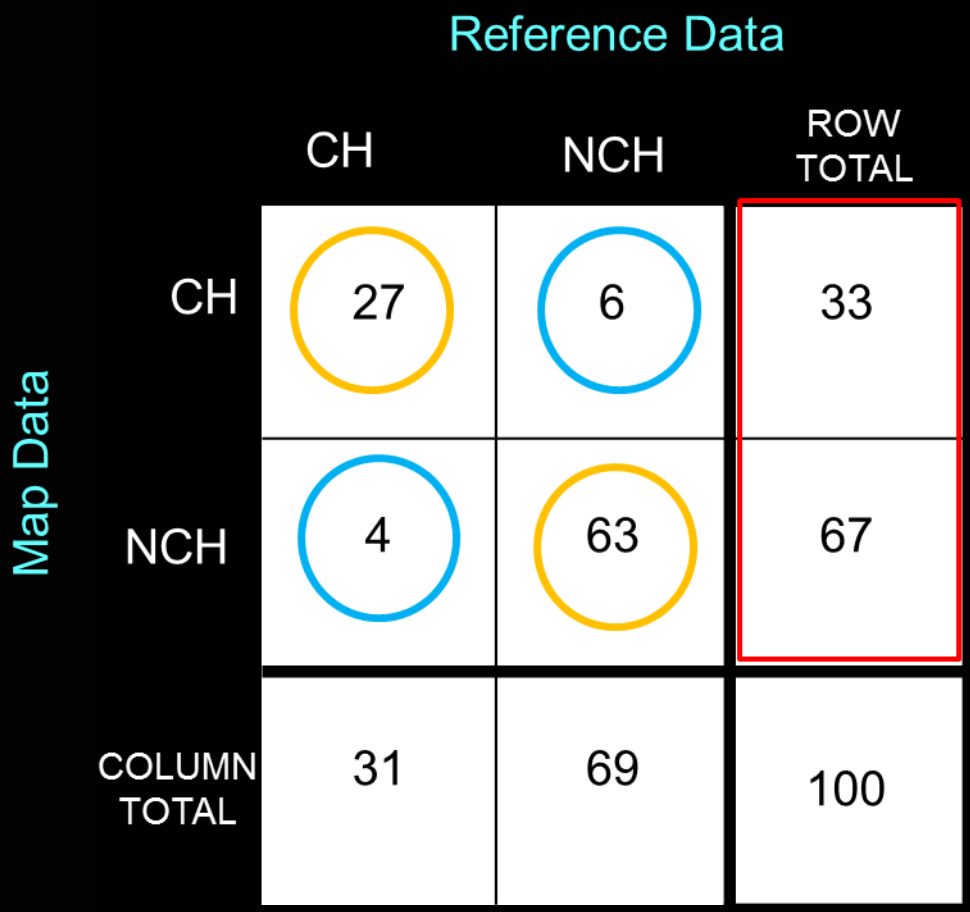
Change:

4/31 *100 = 13%

Non-change:

6/69 *100 = 9%

Change Map- Error Matrix



User's accuracy

Change:

27/33 * 100 = 82%

Non-change:

63/67 * 100 = 94%

This tells the user that there is an 82% chance that a site mapped as change is truly change.

Errors of Commission

Change:

6/33 *100 = 18%

Non-change:

4/67 *100 = 6%

Site Specific Accuracy - Summary

- It's more complicated than simply reporting overall accuracy…
  - Consider the relative costs of omission vs commission errors
  - These considerations should influence your choice of analysis methods, thresholds, post processing steps, etc.

Limitations

- Doesn’t consider the accuracy of the change blob boundaries
- With multiple change classes:
  - Makes no distinction for the magnitude of error
  - Assumes each site can only be assigned to one map category

Questions/Comments?

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