

# Accuracy Assessment of Land Cover.

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Development

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# Why Accuracy Assessment?

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Most common questions from the remote sensing expert about land cover



What is the accuracy of land cover?

Have you done land cover validation?



- Assess how well a classification worked
- Understand how to interpret the usefulness of someone else's classification

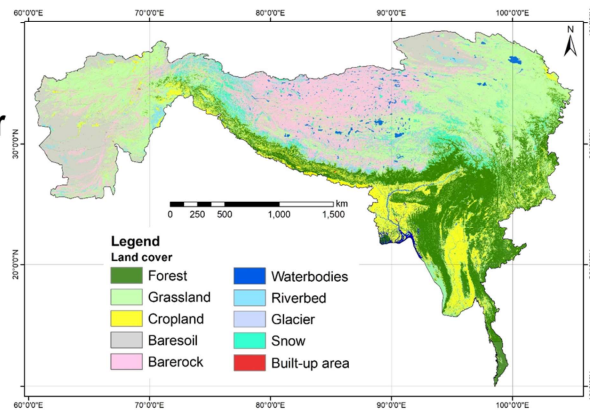
# Why Accuracy Assessment?

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## Classification error

- Assignment of a pixel of a class to another class

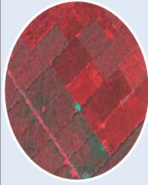


To Validate the proportion of agreement between a classified map and reference data assumed to be correct

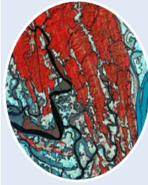
# Accuracy Assessment

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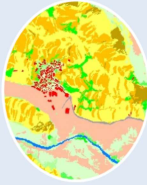
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Selection of  
quality TM  
image



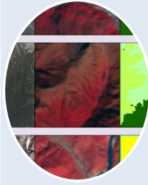
Quality of  
image  
objects



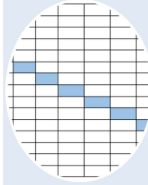
Investigation  
of classified  
land cover



Feedback  
from the  
experts



Verification  
with Google  
image



Accuracy of  
Land cover  
assessment



# Accuracy Assessment: Reference Data

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## Some possible sources

- Aerial /UAV photo interpretation
- Ground truth with GPS
- GIS layers
- Collect Earth Online and others

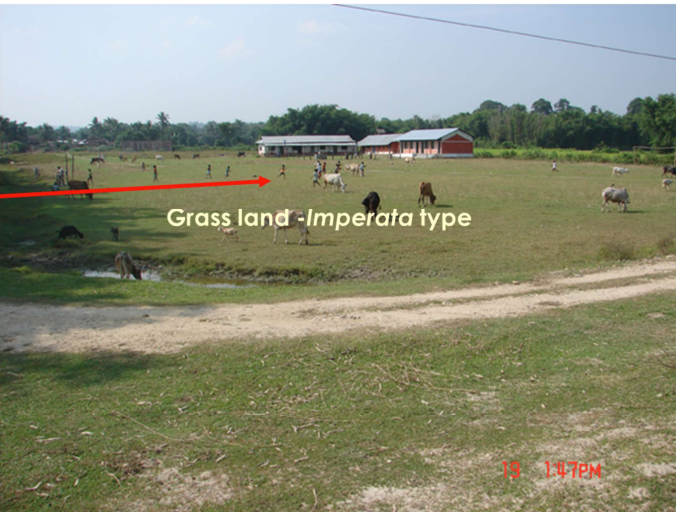


# Accuracy Assessment: Reference Data

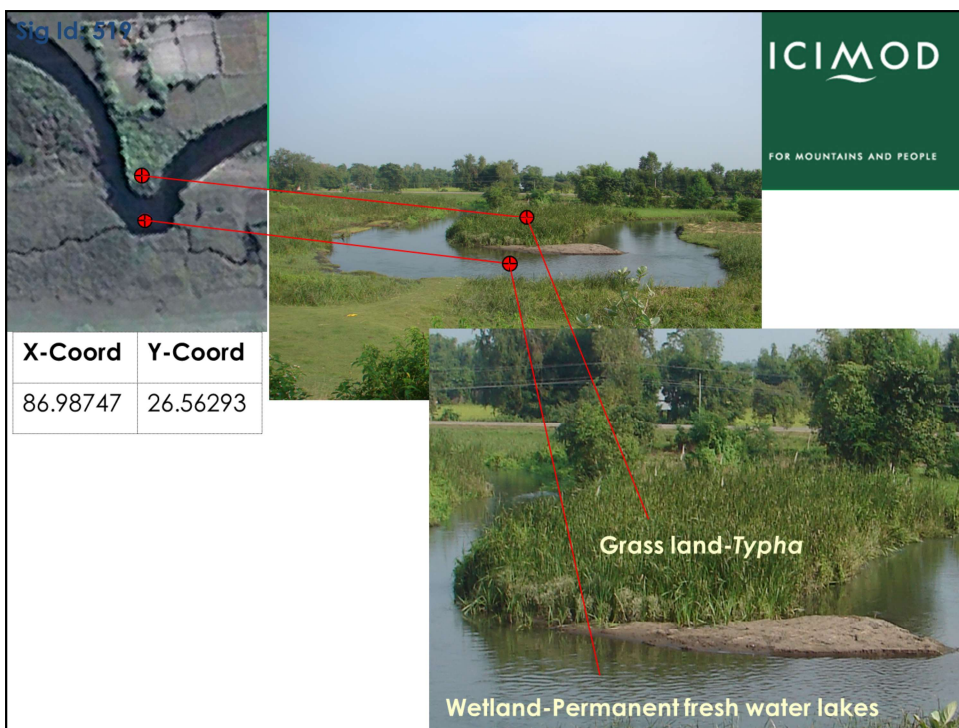
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Sig Id: 430



X-Coord	Y-Coord
86.93280	26.70708



# Accuracy Assessment: Reference Data

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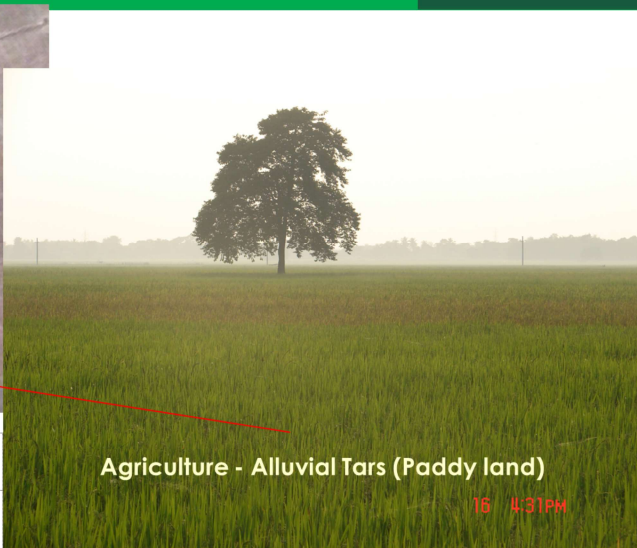
Sig Id: 126



X-Coord	Y-Coord
86.93070	26.64202

Agriculture - Alluvial Tars (Paddy land)

16 4:31PM





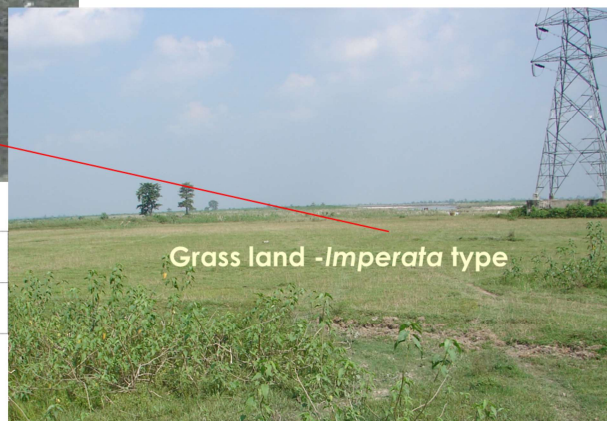
# Accuracy Assessment: Reference Data

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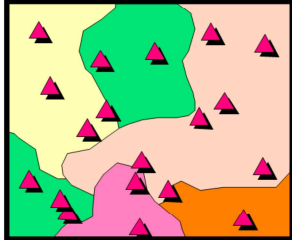
X-Coord	Y-Coord
86.94518	26.64141



# Sampling Methods

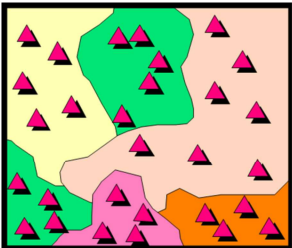
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## Simple Random Sampling:

- Observations are randomly placed



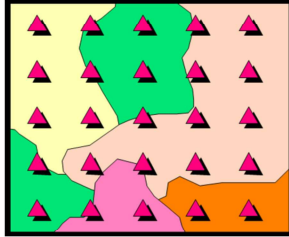
## Stratified Random Sampling:

- Minimum number of observations are randomly placed in each category

# Sampling Methods

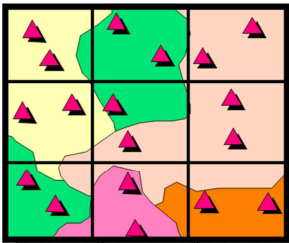
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## Systematic Sampling:

- Observations are placed at equal intervals according to a strategy



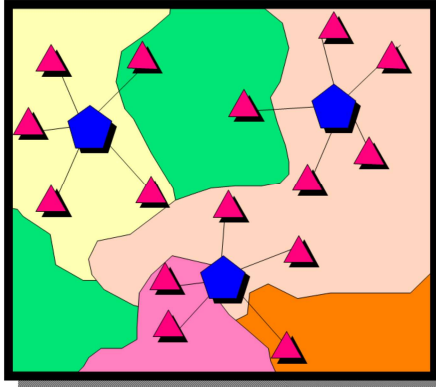
## Systematic Non-Aligned Sampling

- A grid provides evenly distribution of randomly placed observations

# Sampling Methods

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## Cluster Sampling:

- Randomly placed “centroids” are used as a base of several nearby observations.
- The nearby observations can be randomly selected, systematically selected etc.

# Accuracy Metrics

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**The error matrix allows to calculate the following accuracy metrics:**

- Overall Accuracy and Error
- User's accuracy
- Producer's accuracy
- Errors of omission
- Errors of commission
- Accuracy statistics (e.g., Kappa)

# Accuracy Equations

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$$\text{Producer's accuracy} = \frac{\text{Number of samples correctly classified in a given class}}{\text{Total number of samples chosen for that class}} \times 100$$

$$\text{User's accuracy} = \frac{\text{Number of samples correctly classified in a given class from the selected samples in that group}}{\text{Total number of samples classified in that group out of entire samples selected}} \times 100$$

$$\text{Overall accuracy} = \frac{\text{Total Number of reference samples chosen}}{\text{Total number of correctly classified samples}} \times 100$$

# Accuracy Assessment

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- **Example:**

Reference ID	Class determined from reference source	Class claimed on classified map	Agreement
1	Conifer	Conifer	Yes
2	Hardwood	Conifer	No
3	Water	Water	Yes
4	Hardwood	Hardwood	Yes
5	Grass	Hardwood	No

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## User's Accuracy

Class types determined from classified map	Class types determined from reference source				
	# Plots	Conifer	Hardwood	Water	Total
	Conifer	50	5	2	57
	Hardwood	14	13	0	27
	Water	3	5	8	16
	Totals	67	23	10	100

Example: Conifer

$$Accuracy_{User's, Conifer} = \frac{50}{57} * 100 = 88\%$$

$$User's\ accuracy = \frac{\text{Number of samples correctly classified in a given class from the selected samples in that group}}{\text{Total number of samples classified in that group out of entire samples selected}} * 100$$



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## User's Accuracy

Class types determined from classified map	Class types determined from reference source				
	# Plots	Conifer	Hardwood	Water	Total
	Conifer	50	5	2	57
	Hardwood	14	13	0	27
	Water	3	5	8	16
	Totals	67	23	10	100

Example: Conifer

$$Accuracy_{\text{producer, Conifer}} = \frac{50}{67} * 100 = 75\%$$

$$\text{Producer's accuracy} = \frac{\text{Number of samples correctly classified in a given class}}{\text{Total number of samples chosen for that class}} \times 100$$

# Accuracy Assessment

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## Overall Accuracy

Class types determined from classified map	Class types determined from reference source				
	# Plots	Conifer	Hardwood	Water	Total
	Conifer	50	5	2	57
	Hardwood	14	13	0	27
	Water	3	5	8	16
	Totals	67	23	10	100

$$Accuracy_{Total} = \frac{50+13+8}{100} * 100 = 71\%$$

- Diagonals represent correctly classified pixels based on reference data
- Off-diagonals represent mis-classified pixels

$$Overall\ accuracy = \frac{Total\ Number\ of\ reference\ samples\ chosen}{Total\ number\ of\ correctly\ classified\ samples} \times 100$$

# Key concerns and improvements

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Elevation



Aspect



BL Forest



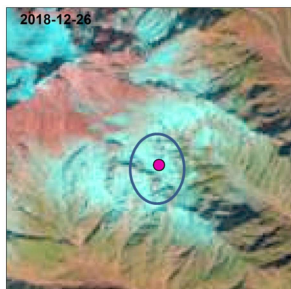
Agriculture



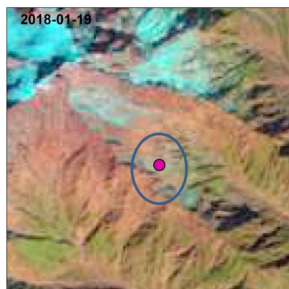
Grass



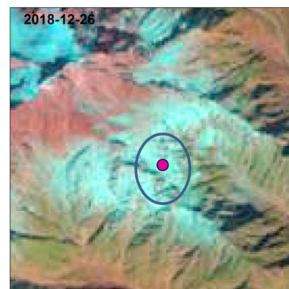
2018-12-26



2018-01-19



2018-12-26



# Key concerns and improvements

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BL Forest



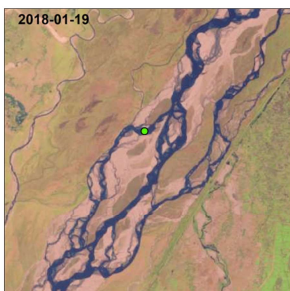
Agriculture



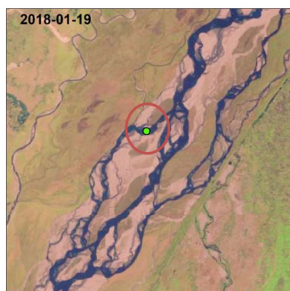
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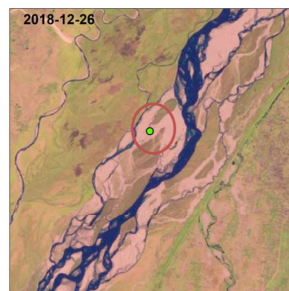
2018-01-19



2018-01-19



2018-12-26



# Key concerns and improvements

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Elevation



Aspect



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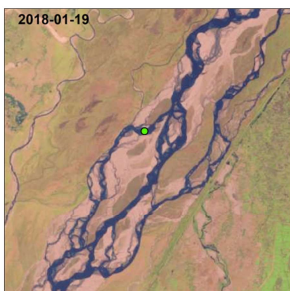
Agriculture



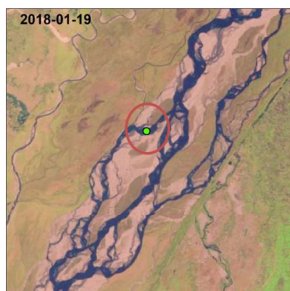
Grass



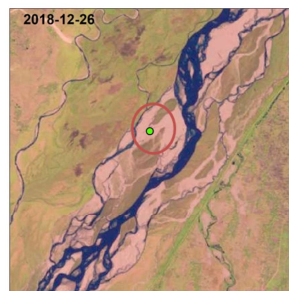
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# Key concerns and improvements

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Elevation



Aspect



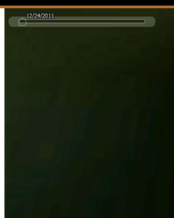
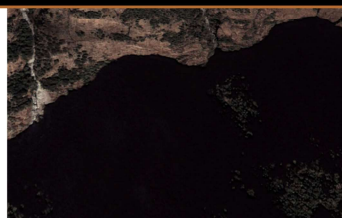
BL Forest



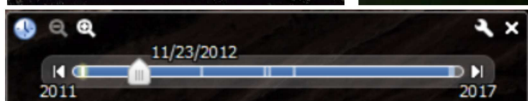
Agriculture



Grass



Training and validation  
sample collection



# Thank you

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