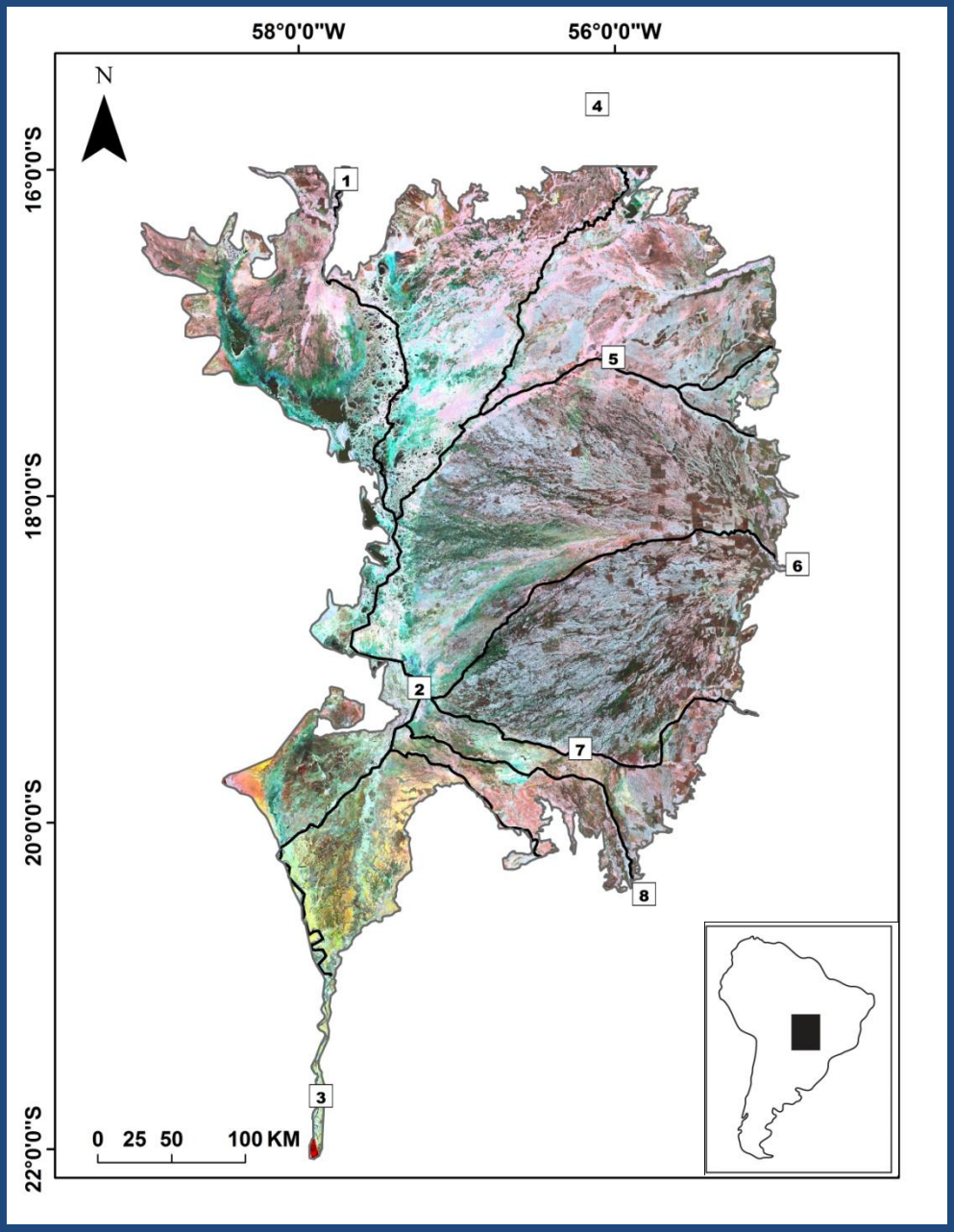
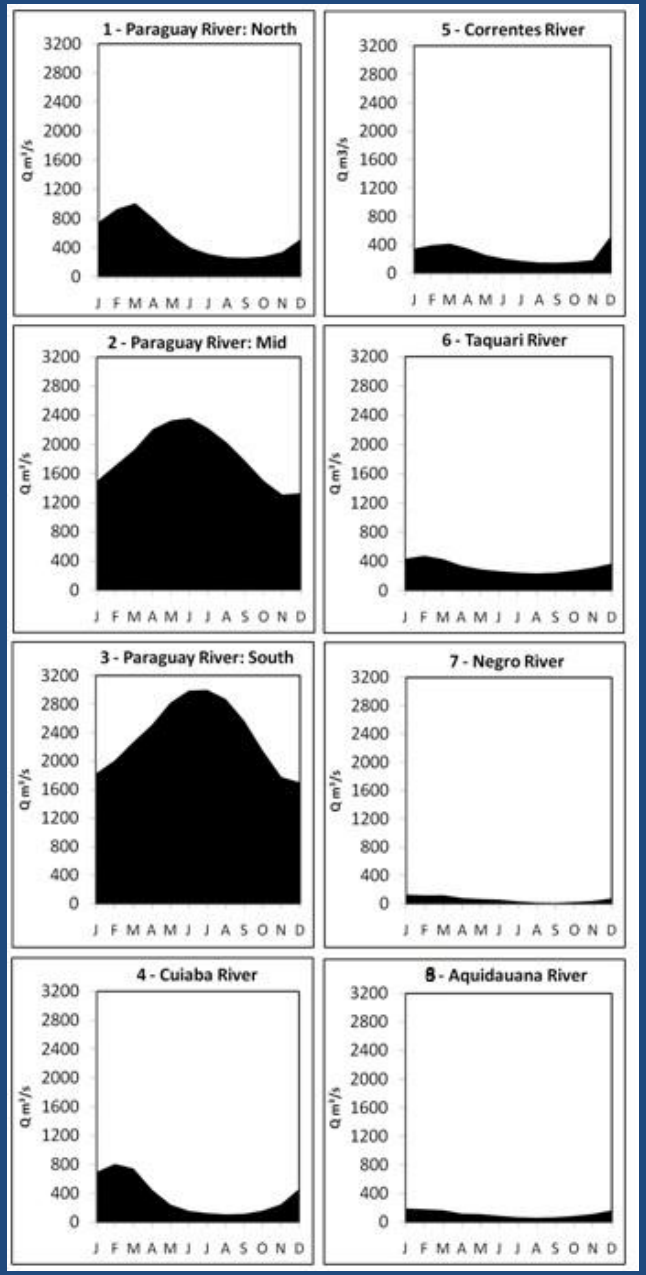
Land Cover Classification and Seasonal Inundation of the Pantanal of South America Using Multi-SAR Imagery and an Object Based Image Analysis Approach

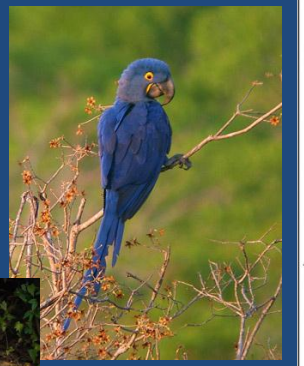
Teresa Evans[1] (tevans@uvic.ca), Maycira Costa[1] (maycira@uvic.ca)
Walfrido Tomas[2], Andrés Restel[2]
[1]University of Victoria, Department of Geography, SPECTRAL Laboratory
[2]EMBRAPA Pantanal, Brazil

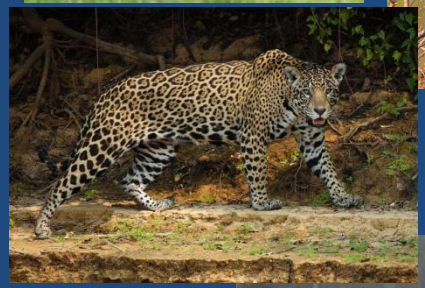
Study Area – The Pantanal Wetland

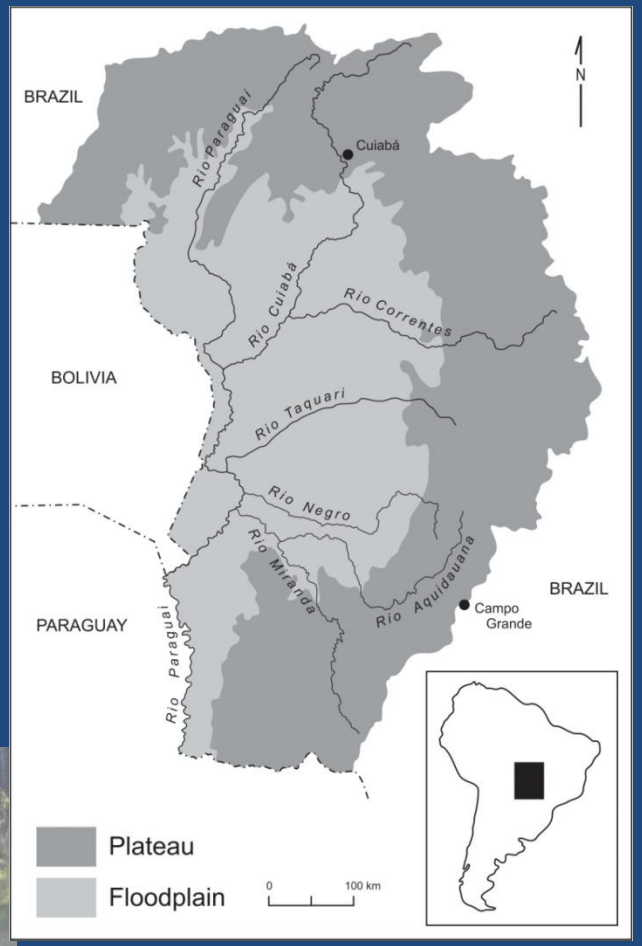




Importance, threats…





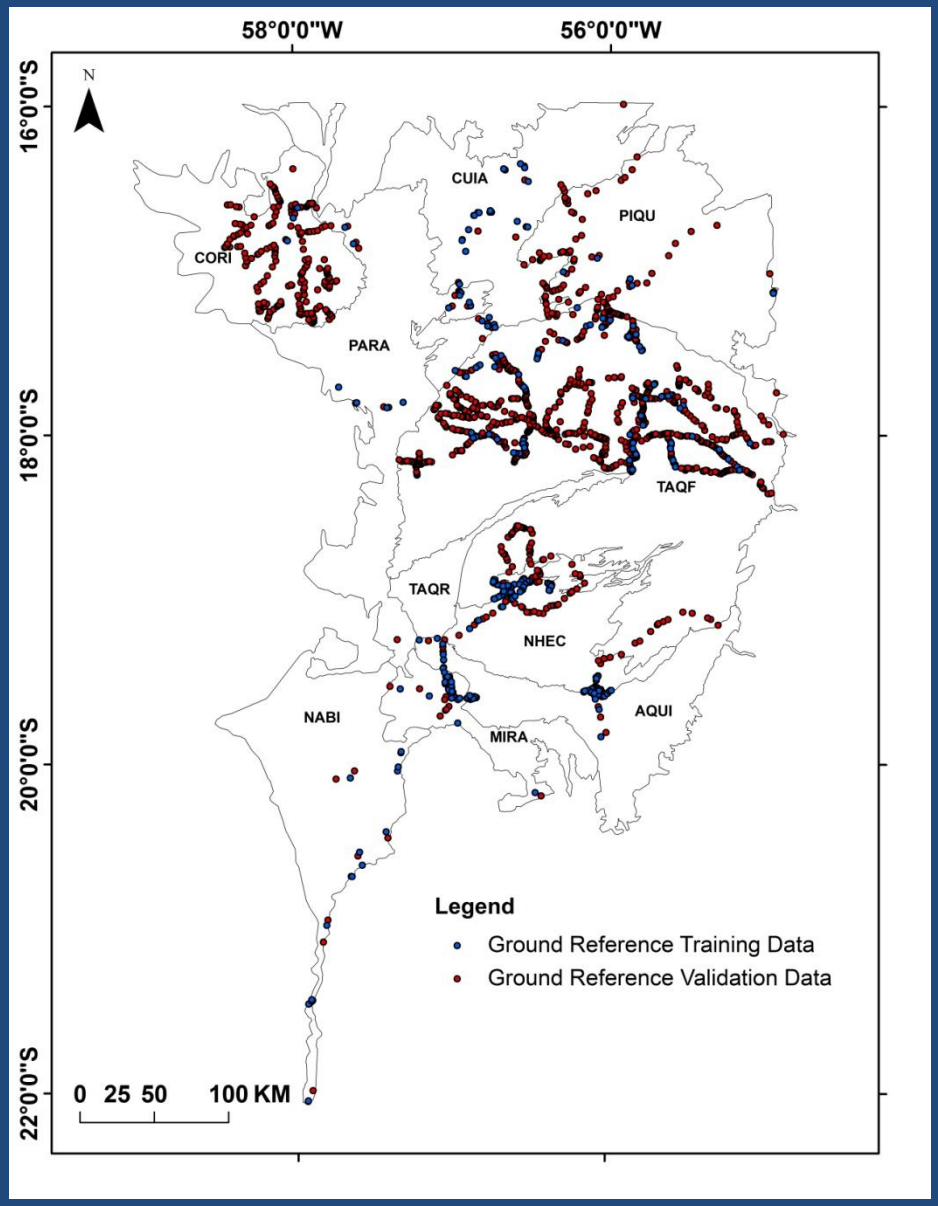


Objectives:

The objective of this study was to use multi-temporal L-band ALOS/PALSAR imagery (50m spatial resolution) and C-band RADARSAT-2 imagery (50m spatial resolution) to map the various ecological habitats in the Brazilian Pantanal. This was accomplished via:

1) Dividing the Pantanal into hydrological subregions defined in Hamilton et al. (1996)
2) Classifying each of the subregions separately to exploit temporal differences in flooding dynamics

Data



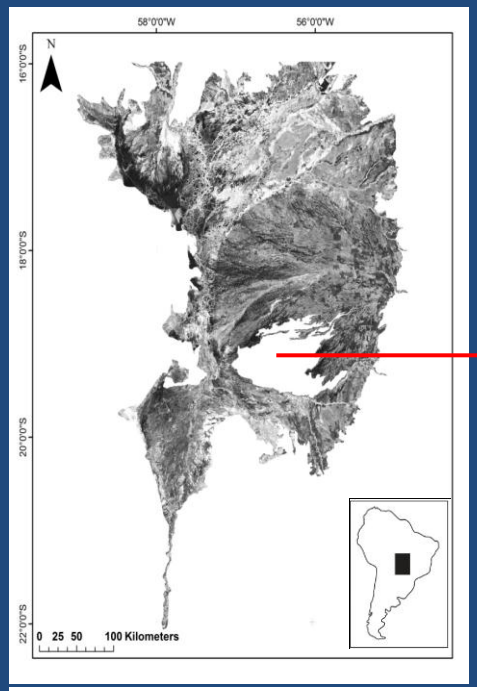
619 total ground reference points:
- 2008 field campaign
- additional points from EMBRAPA P ANTANAL

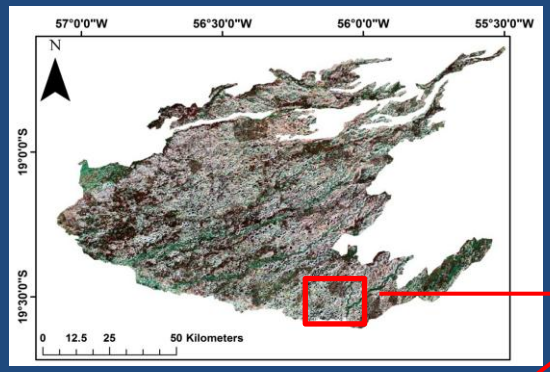
SAR Imagery Set:
ALOS PALSAR 50m spatial resolution
- Wet season HH
- Dry season HH/HV

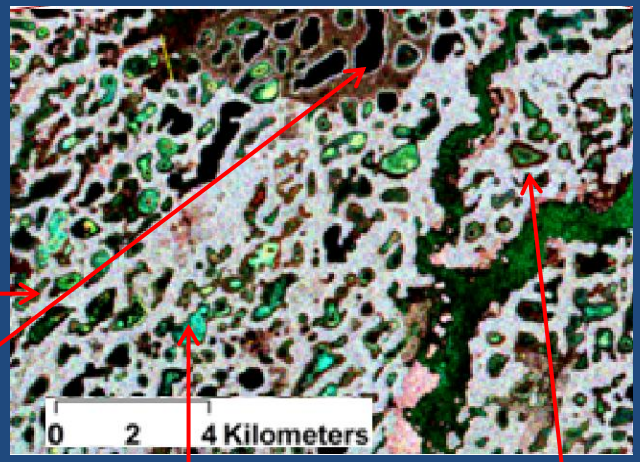
Radarsat-2 50m spatial resolution
- Dry season HH/HV

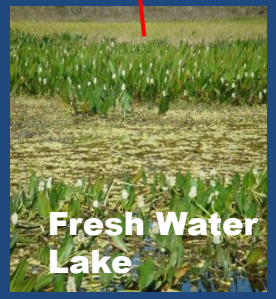
Vectors:
- Subregion boundaries based on Hamilton et al. (1996)
- Mask for Nhecolândia Lakes

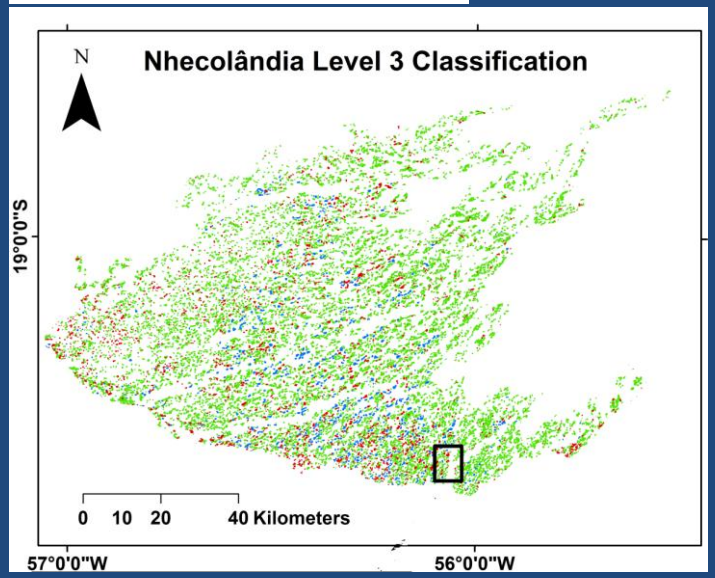
Lower Nhecolândia - Creation of Lakes Mask (Evans and Costa, 2012)

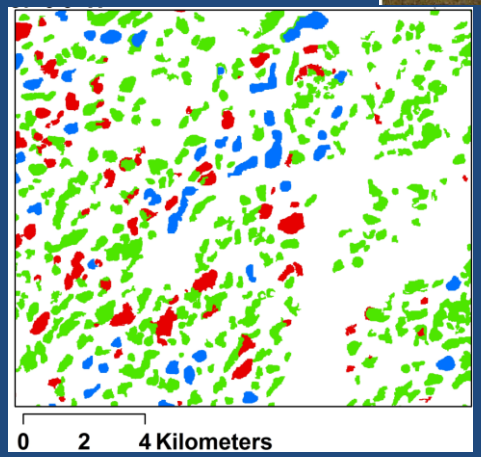






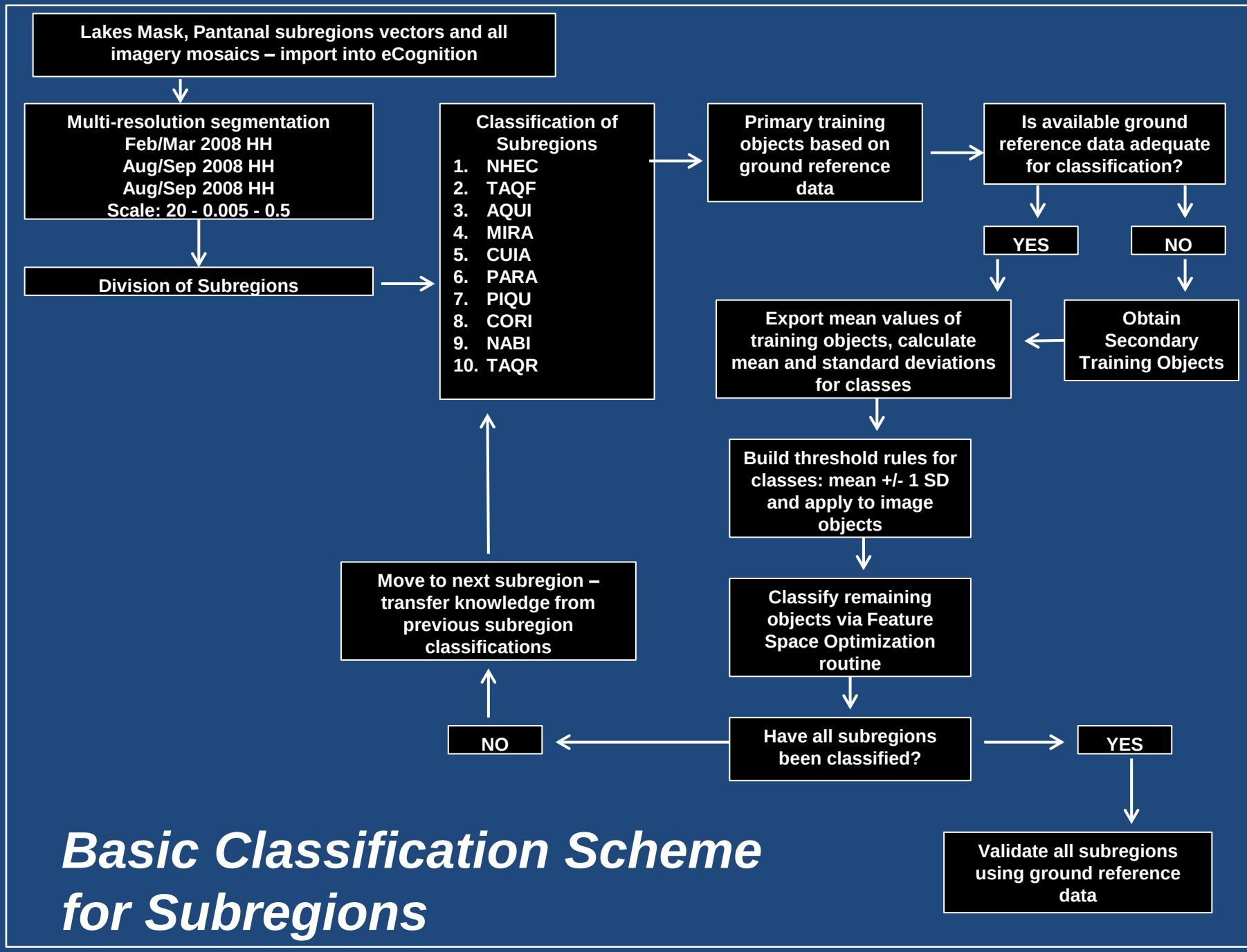




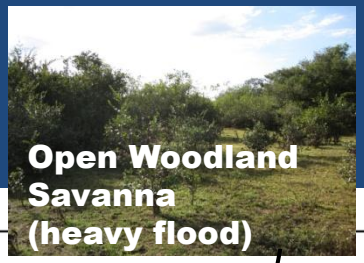


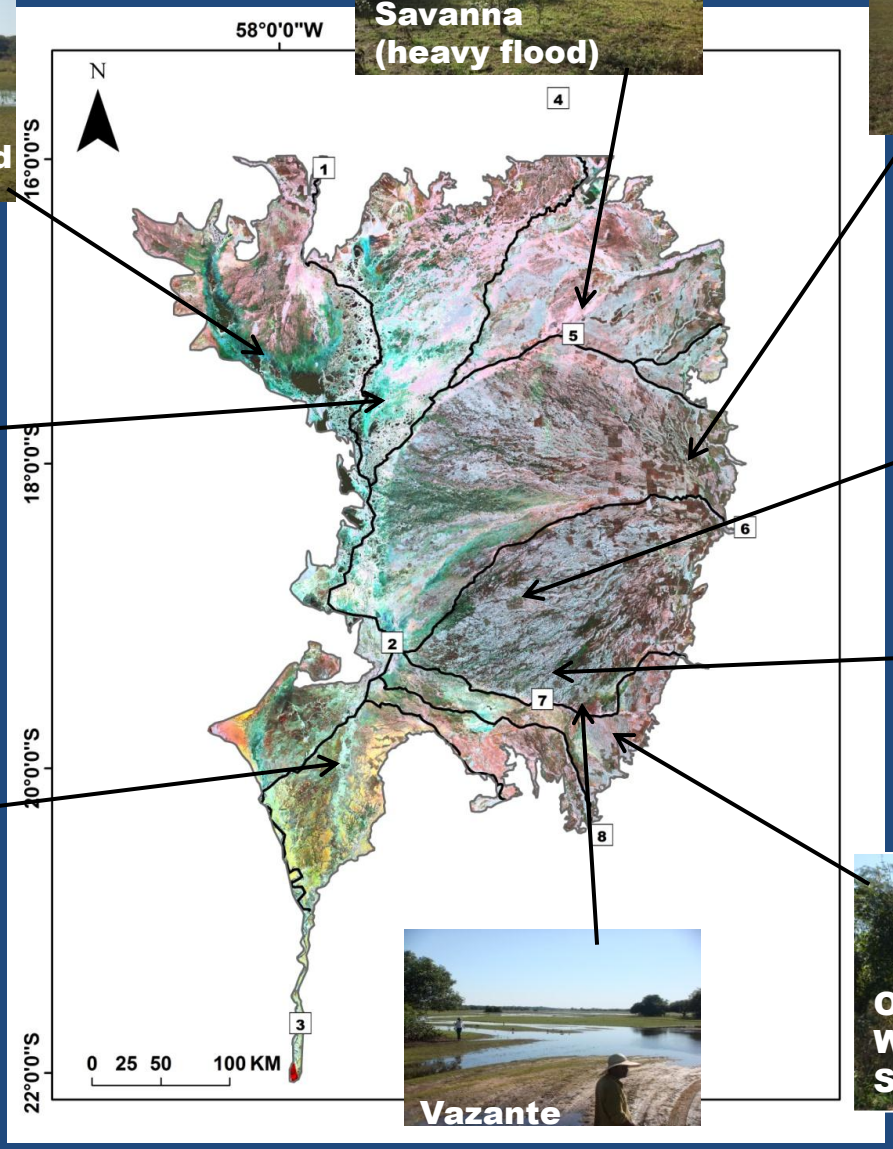
LEGEND

- **Floating and Emergent Vegetation (Fresh Water - *Baia*)**
- **Presence of *Typha sp.* (Fresh Water - *Salobra*)**
- **Brackish Water (*Salina*)**

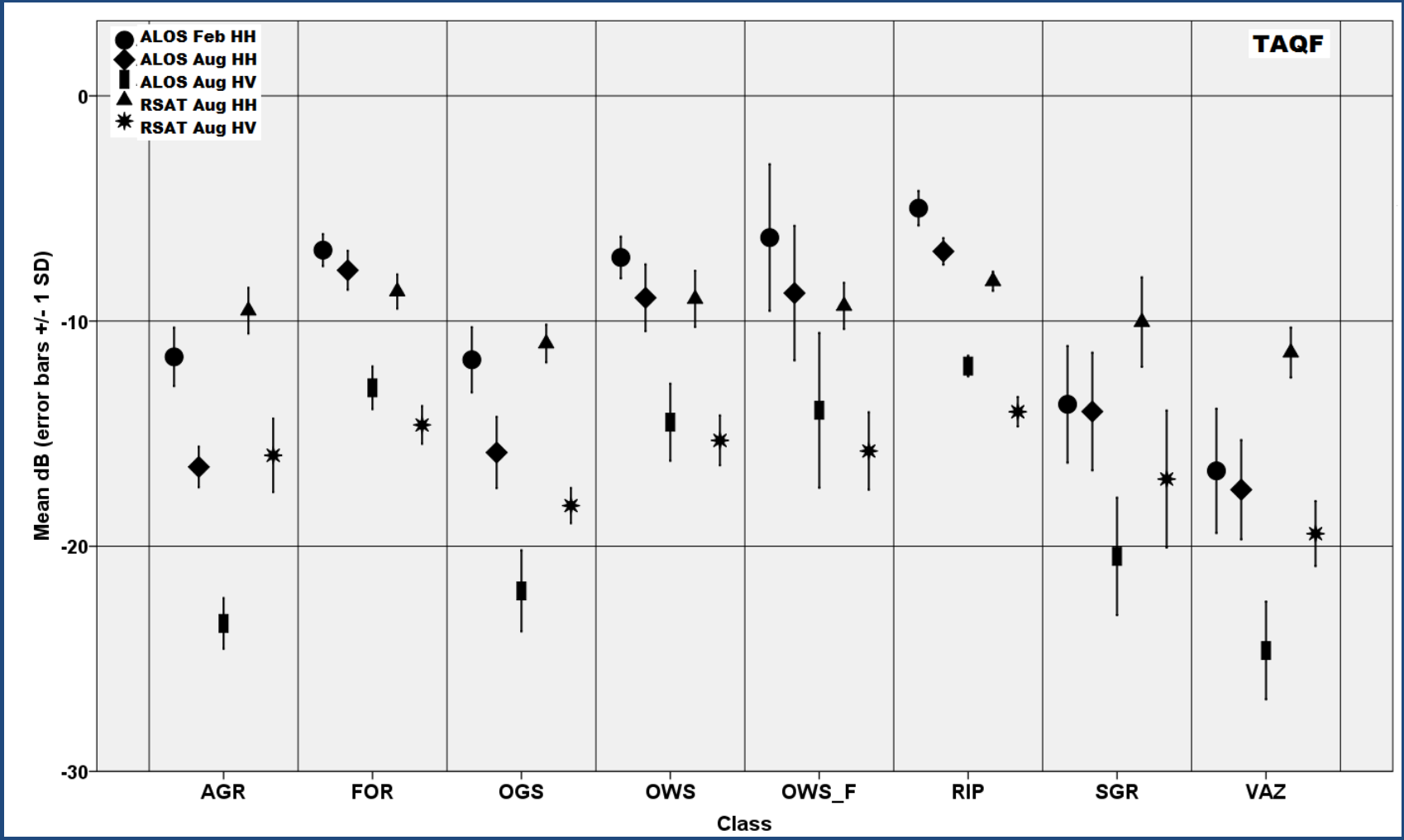

Lakes Mask, Pantanal subregions vectors and all imagery mosaics – import into eCognition
Multi-resolution segmentation
Feb/Mar 2008 HH
Aug/Sep 2008 HH
Aug/Sep 2008 HH
Scale: 20 - 0.005 - 0.5
Division of Subregions
Classification of Subregions
1. NHEC
2. TAQF
3. AQUI
4. MIRA
5. CUIA
6. PARA
7. PIQU
8. CORI
9. NABI
10. TAQR
Primary training objects based on ground reference data
Is available ground reference data adequate for classification?
YES
NO
Obtain Secondary Training Objects
Export mean values of training objects, calculate mean and standard deviations for classes
Build threshold rules for classes: mean +/- 1 SD and apply to image objects
Classify remaining objects via Feature Space Optimization routine
Have all subregions been classified?
NO
Move to next subregion – transfer knowledge from previous subregion classifications
YES
Validate all subregions using ground reference data
Basic Classification Scheme for Subregions

Ground Reference Classes

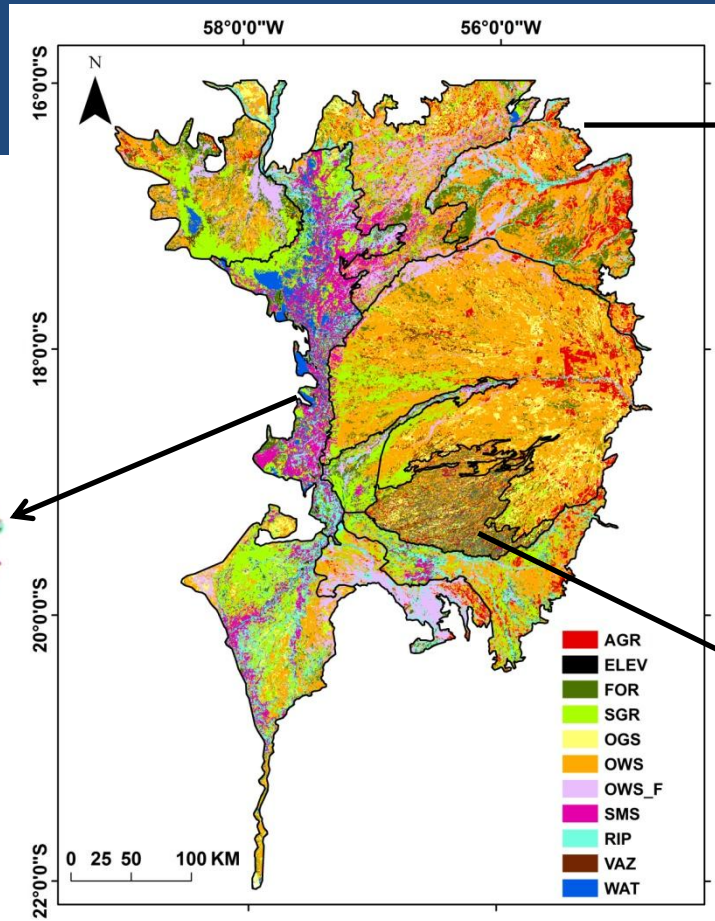




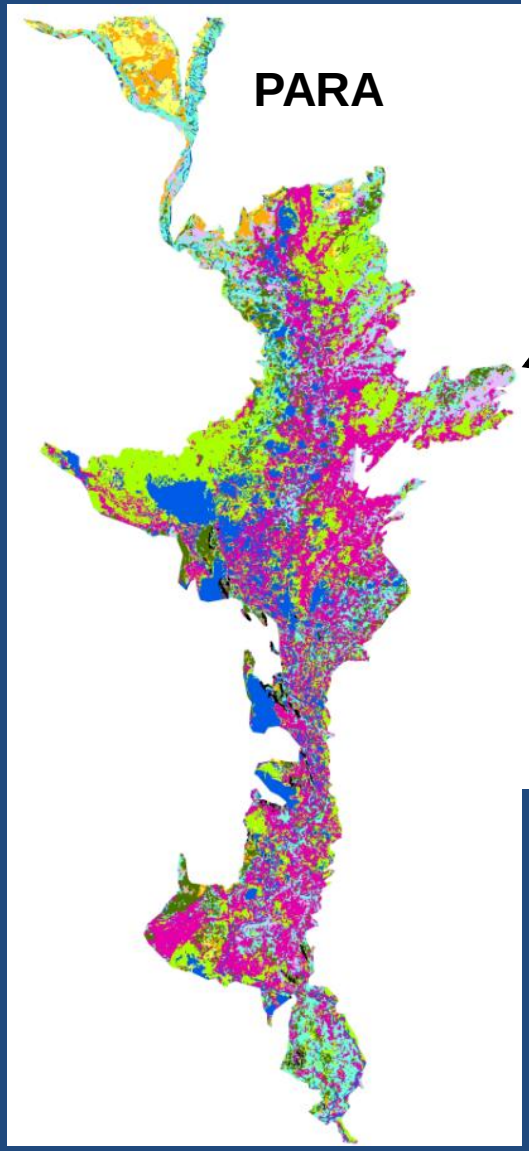
Backscattering Analysis *(example)*



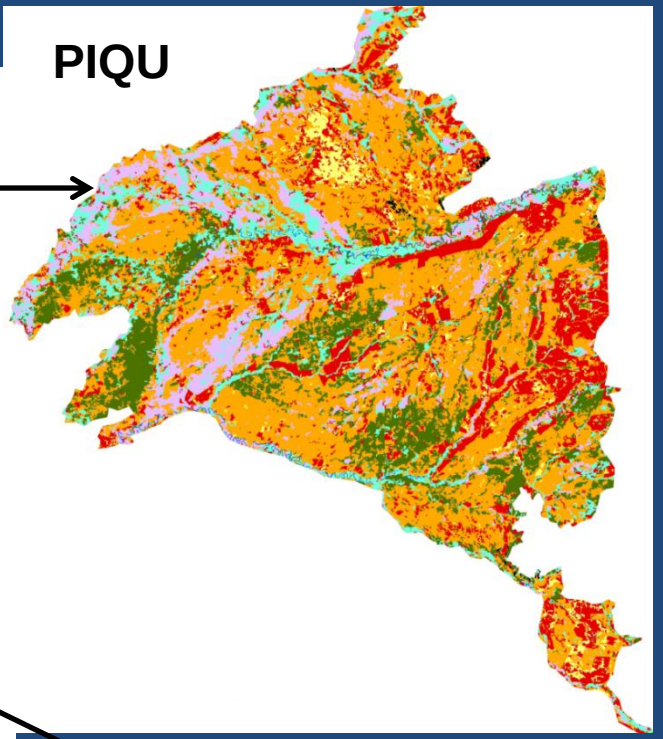
Classification Maps



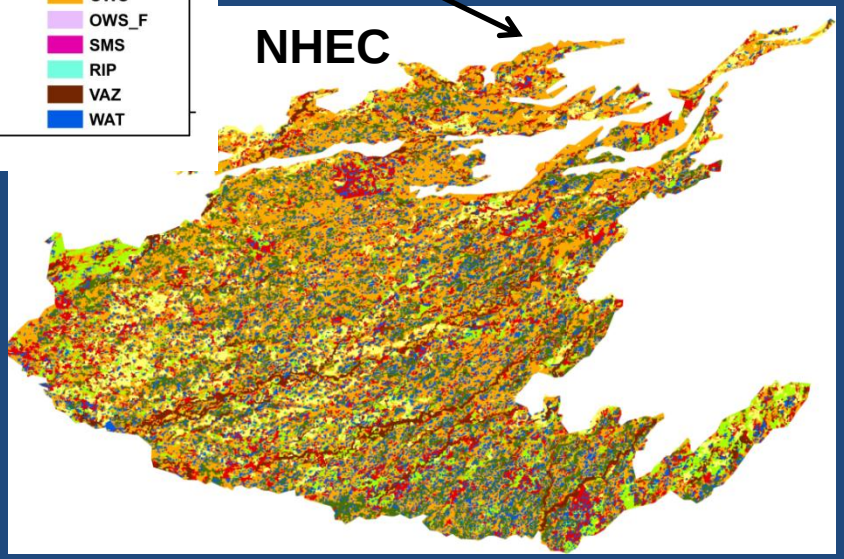
PARA



PIQU



NHEC



Validation Results

OVERALL ACCURACY BY SUBREGION

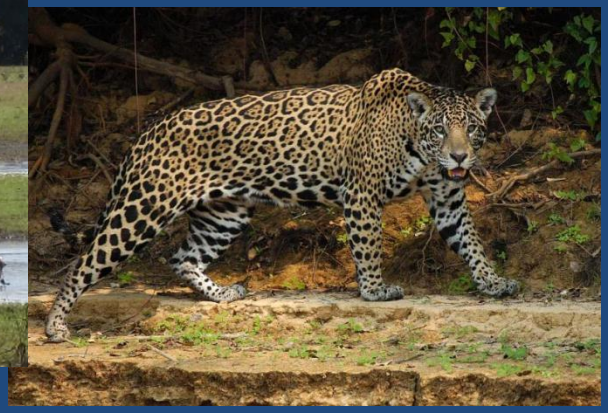
subregion	% correct	subregion	% correct
NHEC	75	PARA	95
TAQF	81	PIQU	87
AQUI	77	CORI	80
MIRA	84	NABI	93
CUIA	50	TAQR	N/A

PANTANAL

GROUND REFERENCE DATA: / CLASSIFIED AS:	FOR	RIP	OWS	OWS_F	OGS	SGR	SMS	AGR	VAZ	WAT	Row Total	Error of Omission (%)
FOR	**60**	4	14	5	0	0	0	0	0	0	83	28
RIP	4	**23**	0	3	0	0	1	0	0	0	31	26
OWS	1	0	**66**	0	0	1	0	0	0	0	68	3
OWS_F	0	4	5	**31**	0	0	0	1	0	0	41	24
OGS	0	0	3	0	**17**	0	0	3	0	0	23	26
SGR	0	0	1	0	4	**51**	0	3	2	1	62	18
SMS	0	1	0	3	0	1	**4**	0	0	0	9	56
AGR	0	0	0	0	3	2	0	**22**	0	0	27	19
VAZ	0	0	0	0	1	6	0	1	**23**	0	31	26
WAT	0	0	0	0	0	0	0	0	0	**16**	16	0
Column Total	65	32	89	42	25	61	5	30	25	17	391	
Error of Commission (%)	8	28	26	26	32	16	20	27	8	6	overall accuracy (% correct)=	**80**

Final Product – the first 50m spatial resolution, detailed habitat distribution map of the entire Pantanal classified using a multi-SAR imagery dataset and splitting the wetland into hydrological subregions, including the spatial distribution of the three types of lake

Will be used for:
1) ongoing local habitat studies in the region (marsh deer, jaguar)
2) Baseline data for monitoring
3) Important information to aid in defining conservation areas



Acknowledgements

SAR Imagery

Ancillary Data

FUNDING

Questions?

FOR MORE INFORMATION…
Contact: Teresa Evans - tevans@uvic.ca
Maycira Costa – maycira@uvic.ca

Or visit the SPECTRAL website:
http://www.mapping.uvic.ca/spectral/