

Experiences and results from the measurements in a forest

National Paying Agency of Lithuania

Content of the presentation

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Legal substantiation (1)

- COMMISSION REGULATION (EC) No 1975/2006

Article 15 - Elements on the on-the-spot checks and determination of areas

However, for the measurements set out in Article 36(b) (iii), (iv) and (v) of Regulation (EC) No 1698/2005, the Member States may define appropriate tolerances, which shall in no case be greater than twice the tolerances set down in Article 30(1) of Regulation (EC) No 796/2004, that is not bigger than 3 meters.

- COUNCIL REGULATION (EC) No 1698/2005.

Article 36(b) – measures targeting the sustainable use of forestry land through

- (iii) first afforestation of non-agricultural land;
- (iv) Natura 2000 payments;
- (v) forest-environment payments;

Legal substantiation (2)

- Area measurement validation scheme JRC
IPSC/G03/P/SKA/asi D(2007)(8307)
- Our requirement for farmers to have clear claimed
area boundaries

Purposes of measurements

- To get ready for measurements in a forest;
- Set down available GPS receivers that can measure in a forest;

There is no question related to measurements in a forest with Trimble GeoXT, Leica GS20 and Mobile Mapper Pro. Only ProMark 3 GPS receiver worked properly;

- To set down a suitable tolerance;
- To estimate and set down the method of the measurements:

Decision to measure points instead of the whole perimeter continuously, because the area boundaries are not clear. Continuously we couldn't measure like in a field, because in a forest can grow trees on a boundaries;

Time stood on each point: 1, 3 and 5 minutes

4 days for measurements

4 repetitions for each area and for 1, 3 and 5 minutes sets.

Preparation for measurements (1)

- Find out reference area;
- Set down reference area;

Two reference areas were set with Nikon NPL-522 total station: 2.084 ha and 0.637 ha;

- Measurements was continue from 12 till 15 of March 2008;
- Measurements was done with GPS receiver ProMark 3;
- Weather was cloudy, but without rain.

Preparation for measurements (2)

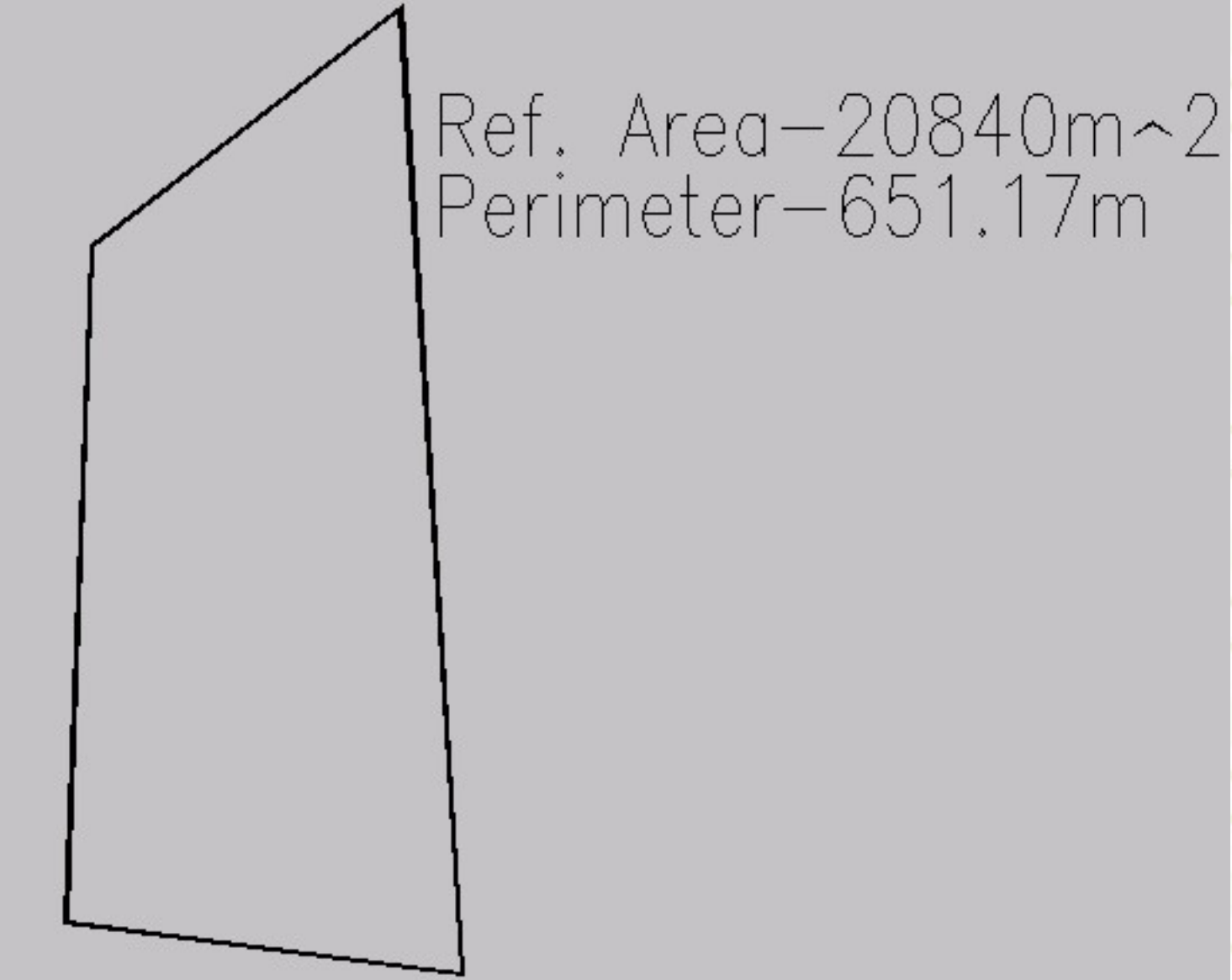


- S/N ratio – unknown because of limited version of ProMark 3;
- PDOP mask - 0;
- Elevation mask – 10 degrees;
- The distance to the base station used in post-processing – 7 kilometers.

Problems that rose up during the measurement process

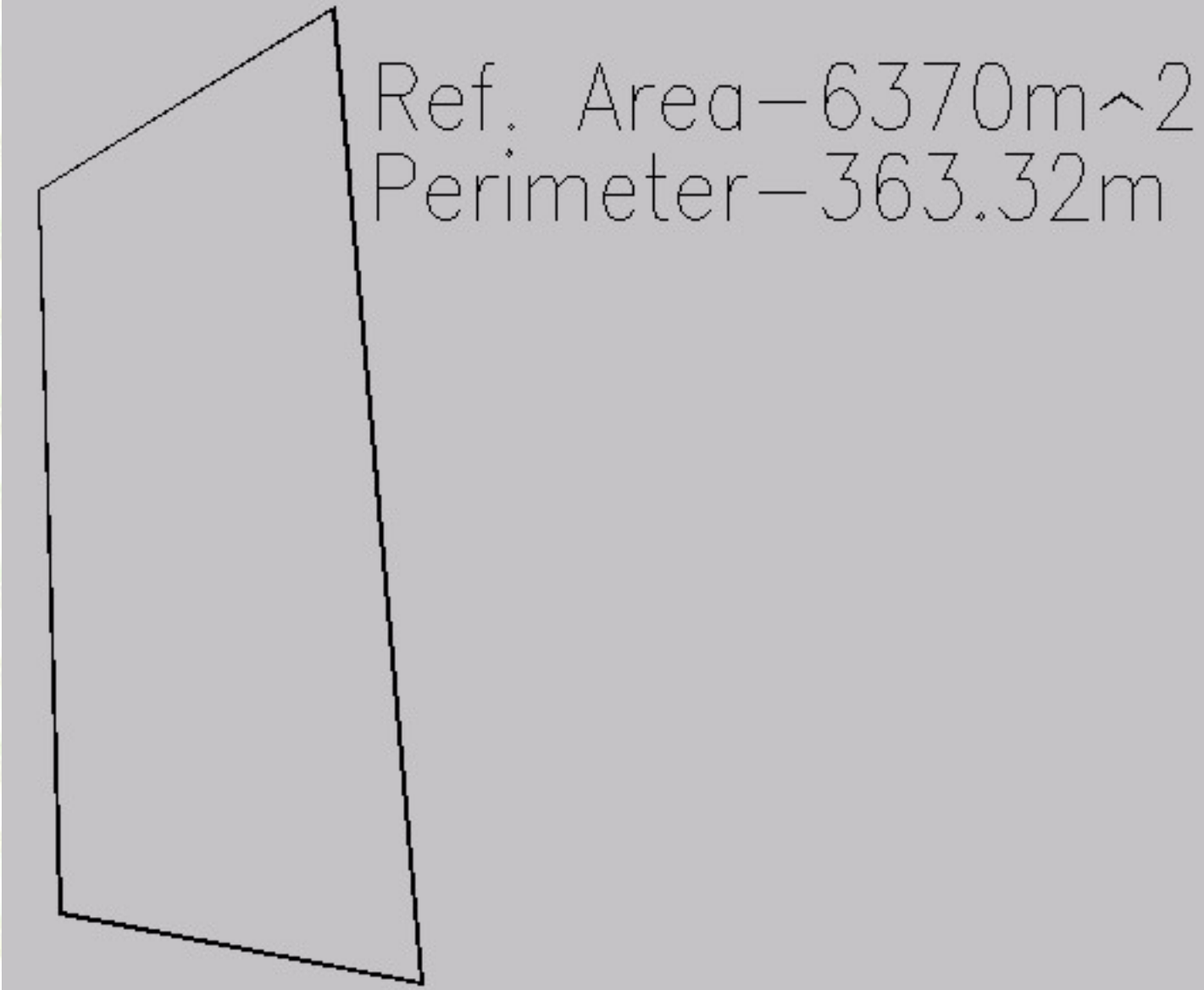
- Not all GPS receivers can view minimal quantity of satellites in a forest that are needed for measurements;
- Changeable and big PDOP value;
- Low number of viewable satellites;
- Multipath appearance in a forest;
- GPS signal obstruction;
- Real time kinematic function doesn't work properly in a forest.

Reference area configuration (1)



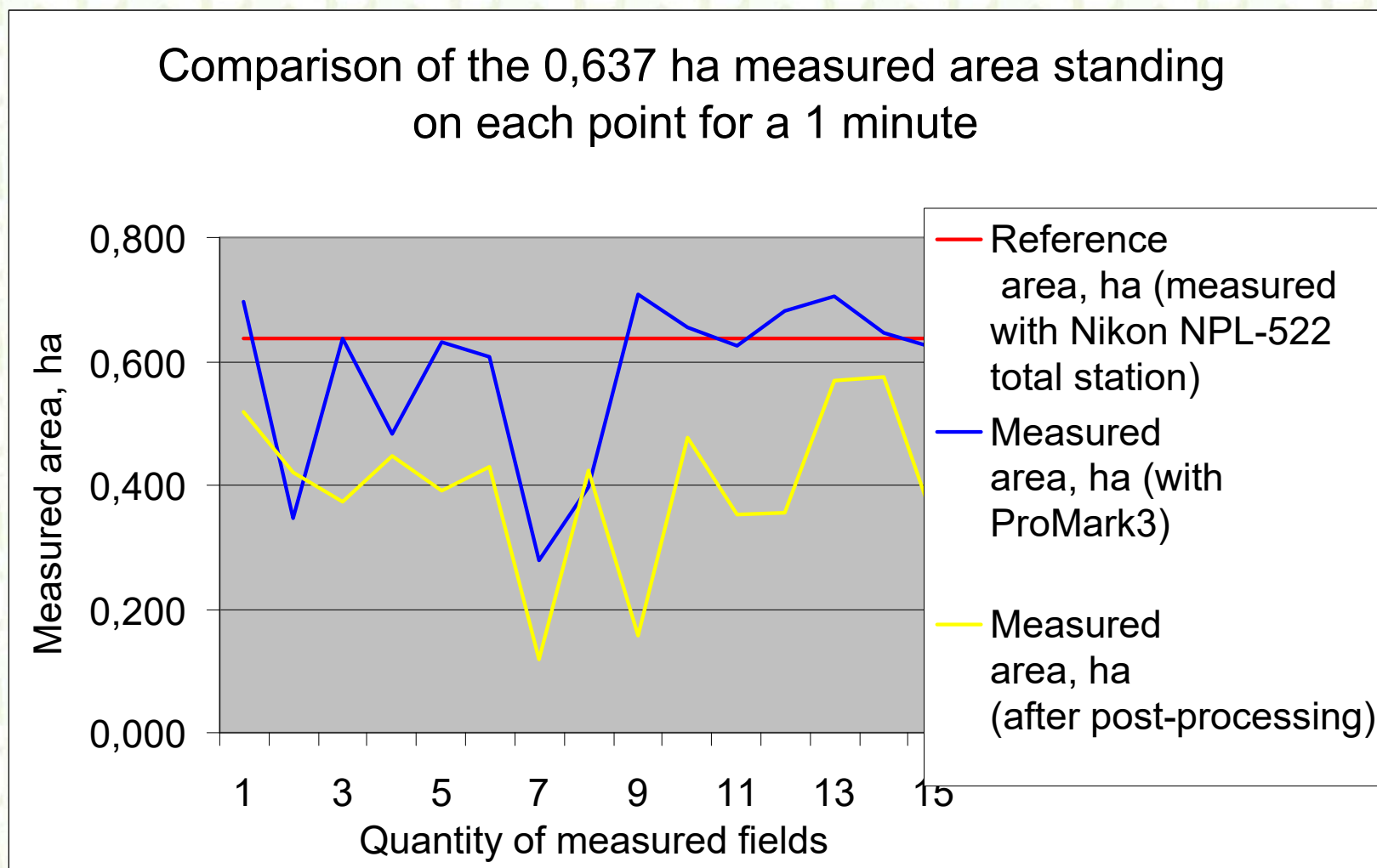
Ref. Area—20840m²
Perimeter—651.17m

Reference area configuration (2)

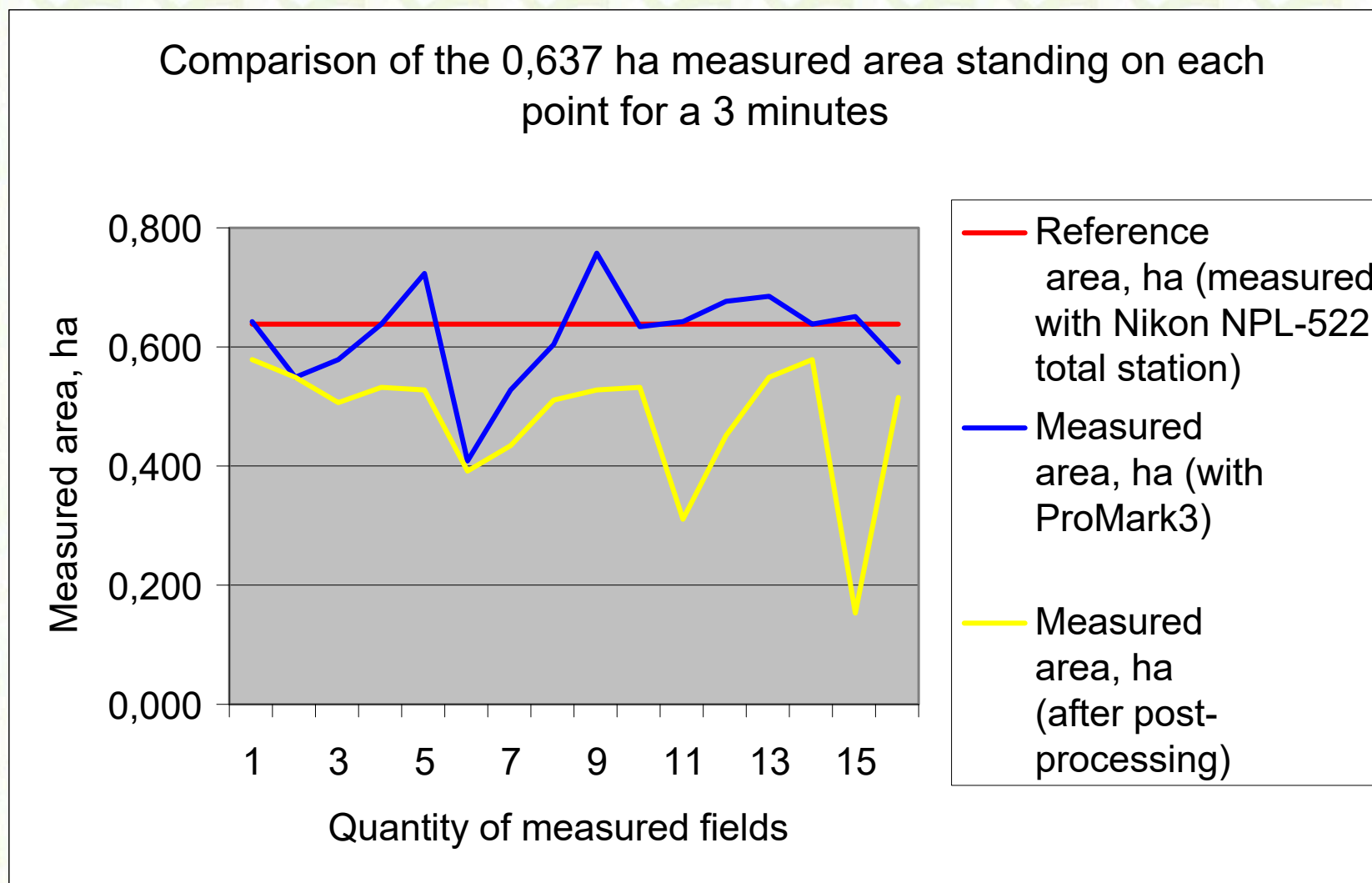


Ref. Area— 6370m^2
Perimeter— 363.32m

Comparison of reference area, measured area and area after post- processing (1)

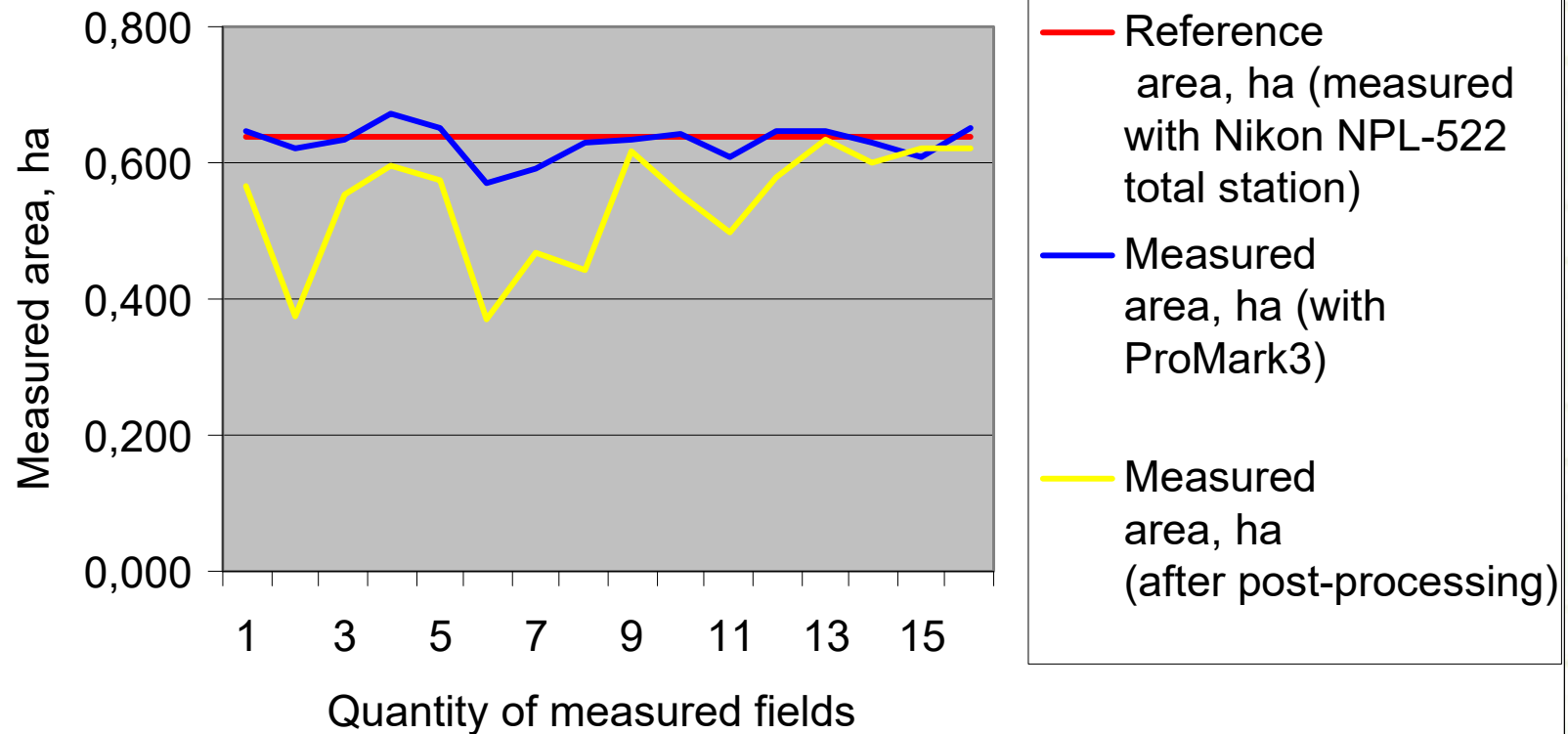


Comparison of reference area, measured area and area after post- processing (2)



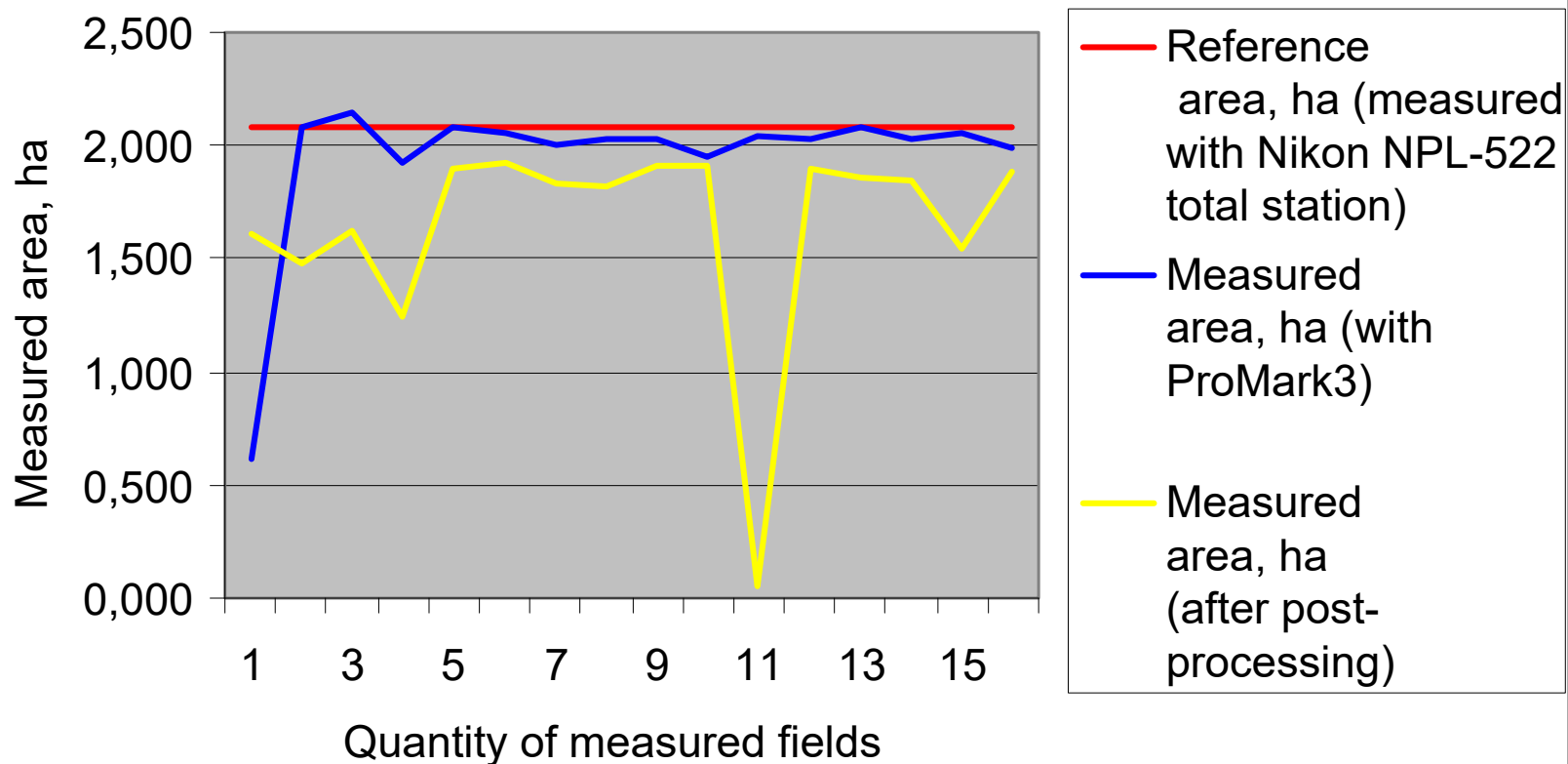
Comparison of reference area, measured area and area after post- processing (3)

Comparison of the 0,637 ha measured area standing on each
point for a 5 minutes

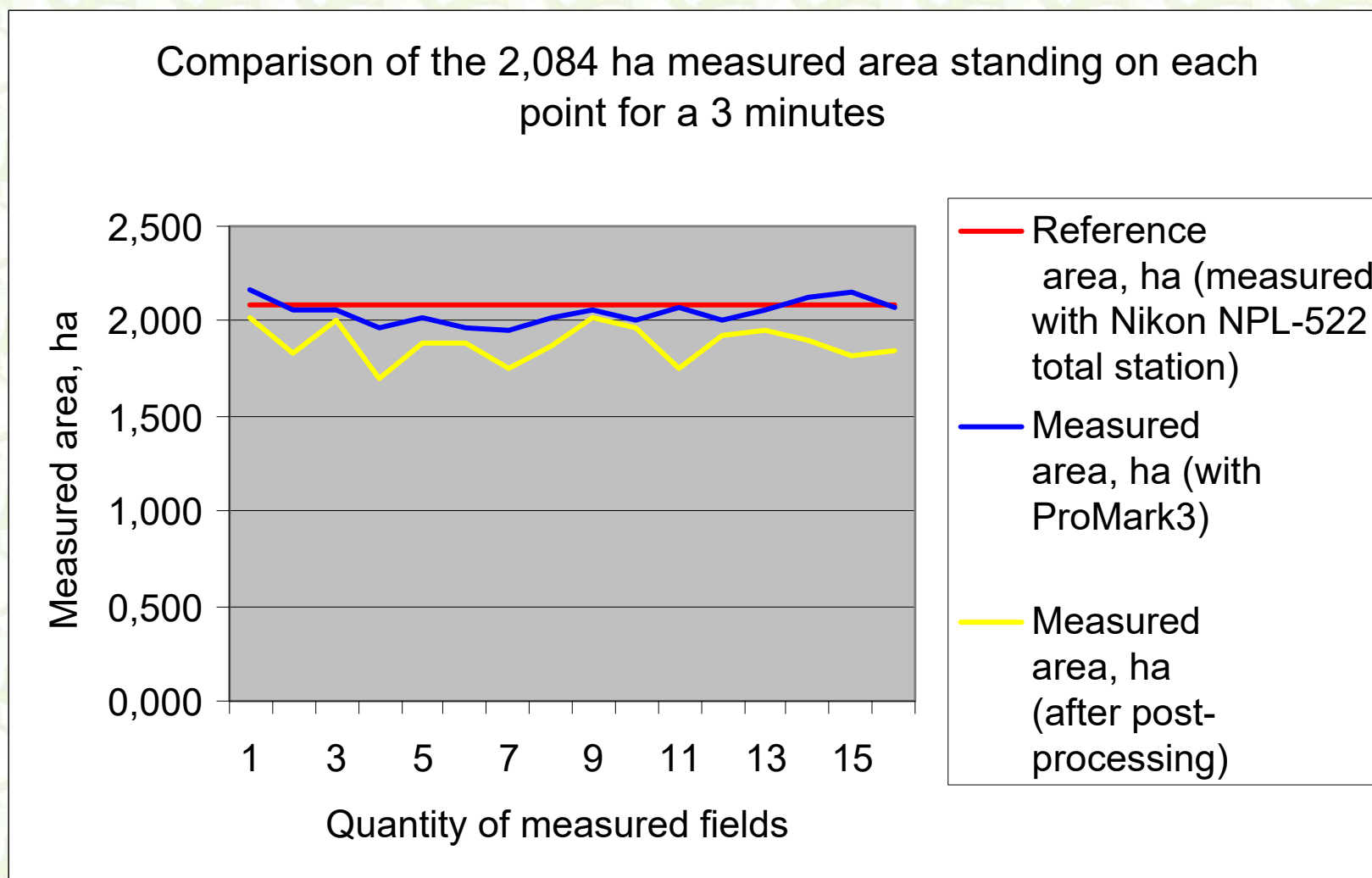


Comparison of reference area, measured area and area after post- processing (4)

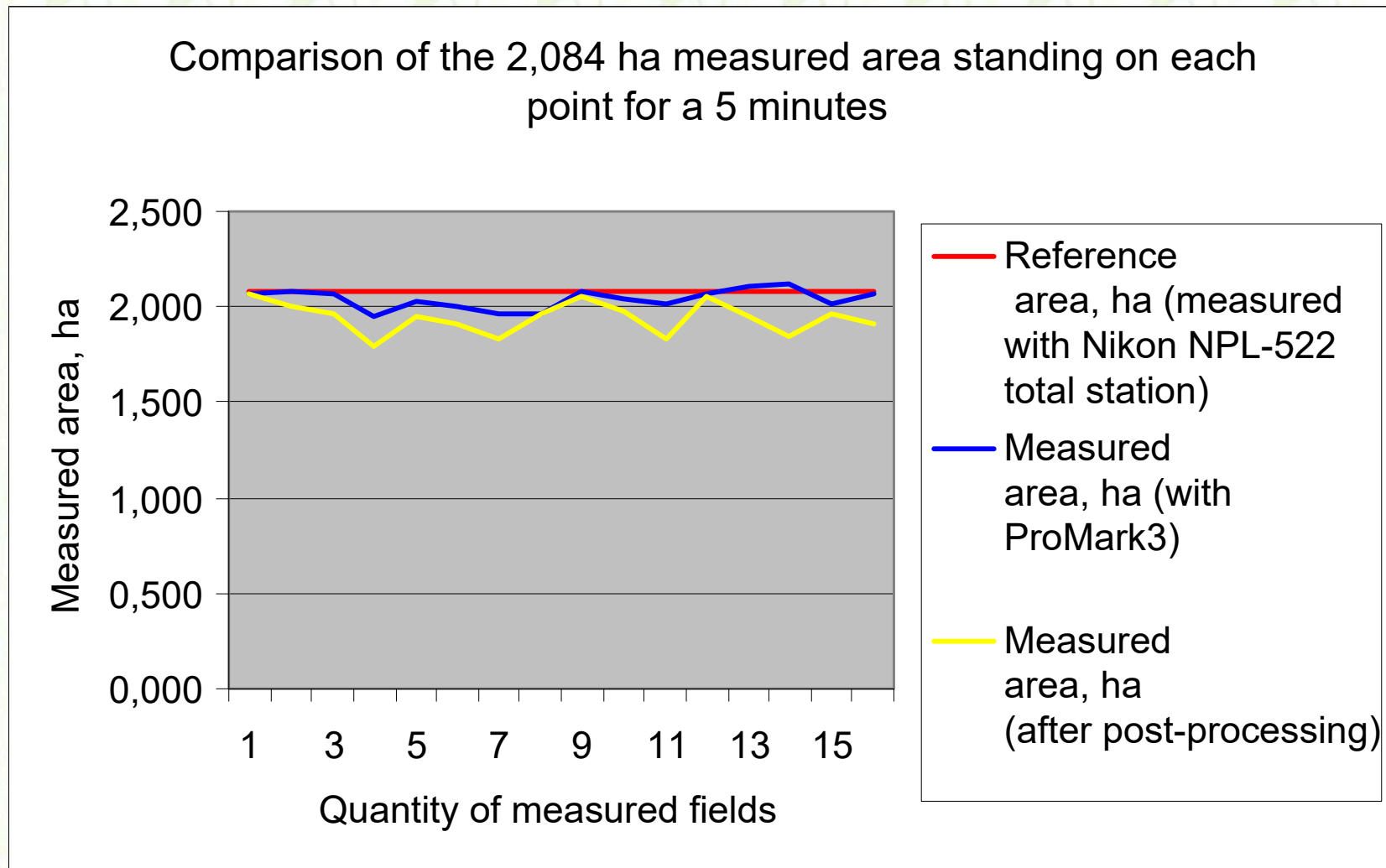
Comparison of the 2,084 ha measured area standing on
each point for a 1 minute



Comparison of reference area, measured area and area after post- processing (5)



Comparison of reference area, measured area and area after post- processing (6)



Results of the measurements before post-processing (1)

Time spent on each point: 1 minute				AREA	Perimeter
			This value is the 1-sigma (67% confidence) buffer	6370	363,32
3.84m	RMSE of mean error (approximation of RSD-R)				
10.79m	95% confidence buffer (approximation of Limit -R)				
Time spent on each point: 3 minutes					
			This value is the 1-sigma (67% confidence) buffer		
2.23m	RMSE of mean error (approximation of RSD-R)				
6.28m	95% confidence buffer (approximation of Limit -R)				
Time spent on each point: 5 minutes					
			This value is the 1-sigma (67% confidence) buffer		
0.70m	RMSE of mean error (approximation of RSD-R)				
1.97m	95% confidence buffer (approximation of Limit -R)				

Results of the measurements before post-processing (2)

Time spent on each point: 1 minute					AREA	Perimeter
				This value is the 1-sigma (67% confidence) buffer	20840	651,17
5.73m	RMSE of mean error (approximation of RSD-R)					
16.09m	95% confidence buffer (approximation of Limit -R)					
Time spent on each point: 3 minutes						
				This value is the 1-sigma (67% confidence) buffer		
1,11m	RMSE of mean error (approximation of RSD-R)					
3,12m	95% confidence buffer (approximation of Limit -R)					
Time spent on each point: 5 minutes						
				This value is the 1-sigma (67% confidence) buffer		
1,02m	RMSE of mean error (approximation of RSD-R)					
2.87m	95% confidence buffer (approximation of Limit -R)					

Results of the measurements after post-processing (1)

Time spent on each point: 1 minute				AREA	Perimeter
			This value is the 1-sigma (67% confidence) buffer	6370	363,32
7.23m	RMSE of mean error (approximation of RSD-R)				
20.32m	95% confidence buffer (approximation of Limit -R)				
Time spent on each point: 3 minutes					
			This value is the 1-sigma (67% confidence) buffer		
5.30m	RMSE of mean error (approximation of RSD-R)				
14.89m	95% confidence buffer (approximation of Limit -R)				
Time spent on each point: 5 minutes					
			This value is the 1-sigma (67% confidence) buffer		
3.48m	RMSE of mean error (approximation of RSD-R)				
9.78m	95% confidence buffer (approximation of Limit -R)				

Results of the measurements after post-processing (2)

Time spent on each point: 1 minute				AREA	Perimeter
			This value is the 1-sigma (67% confidence) buffer	20840	651,17
9.69m	RMSE of mean error (approximation of RSD-R)				
27.22m	95% confidence buffer (approximation of Limit -R)				
Time spent on each point: 3 minutes					
			This value is the 1-sigma (67% confidence) buffer		
3.39m	RMSE of mean error (approximation of RSD-R)				
9.53m	95% confidence buffer (approximation of Limit -R)				
Time spent on each point: 5 minutes					
			This value is the 1-sigma (67% confidence) buffer		
2.53m	RMSE of mean error (approximation of RSD-R)				
7.10m	95% confidence buffer (approximation of Limit -R)				

Results and suggestions (1)

- 3 meters perimeter buffer tolerance should be used for measurements in a forest;
- Only measurements standing on each point for 5 minutes are suitable in a forest;
- Results after post-processing pull off from reference area more than results without post-processing. Post-processing is not useful for measurements in forested areas;
- GPS receivers should be tested before starting to use them for measurements in a forest;
- The measured areas with ProMark 3 are constantly smaller than reference;

Results and suggestions (2)

- Area boundaries should be marked or restricted with natural subjects (ditch, water, way, etc.) and known by the applicant. On the other hand, it would be impossible for the inspector to find boundaries;
- The problem is that for 2.084 ha area 95% confidence buffer is 2.87 m and reproducibility limit is 2.28 m. It's significant bias – about 2%;
- We are still looking for the final answer.

Thank you for your attention