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COMPARING RE-SURVEYS IN ISERNIA AND VENOSA (MOLISE AND BASILICATA, ITALY)

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ABSTRACT

This paper addresses the value of re-surveys in two different regions with different cultural and landscape formation histories: the Upper Volturno basin in Molise (the hinterland of the colony of Aesernia, modern Isernia), and the Melfese area in Basilicata (the hinterland of the colony of Venusia, modern Venosa). In these areas, we compare legacy datasets with newly acquired survey data in the same areas, and compare the results by means of statistics (Chi-square) and visual exploration (cartographical and GIS-based analysis). The statistical comparisons of these different surveys show that site numbers may change significantly. This paper explores the reasons for these dynamics in the archaeological surface record by focussing especially on landscape changes.

KEYWORDS: Survey archaeology, methodology, legacy data, Molise, Basilicata

1. INTRODUCTION

In this paper we analyse the effect of resurveys on our understanding of ancient settlement landscapes, in two different case studies. The first study area is located in the Italian Apennines, in the territory of the Latin colony of Aesernia (263 B.C.). This territory has been investigated in the context of the *Landscapes of Early Roman Colonization* (henceforth: LERC) project (between 2011-2013, see Stek et al. 2015).[i] In the summer of 2015 a portion of this territory was resurveyed, allowing us to compare in detail two datasets that have been collected relatively soon after each other.

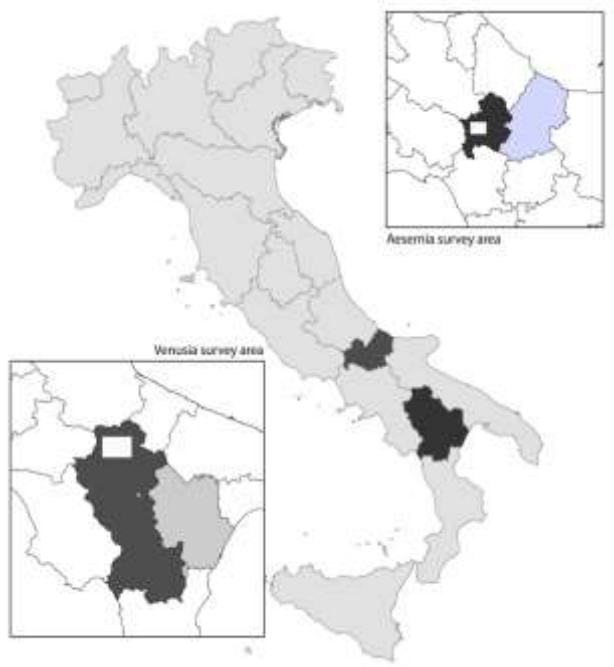

Figure 1. Location of the survey areas

The second case study area is located in modern day Basilicata, in the territory of the Latin colony of Venusia (291 B.C.). This territory was surveyed almost comprehensively in the 1990's (Marchi and Sabbatini 1996; Marchi 2010b; Sabbatini 2001). Because the project was part of and published in the larger Forma Italiae project, we will refer to it with FI project as a shorthand. More than 20 years later, parts of this territory have been resurveyed within the same LERC project. Apart from the significance of these new surveys for the debate on early Roman colonization, which are discussed elsewhere (see e.g. Stek et al. 2015; Pelgrom et al. 2015; Casarotto et al. 2016), these surveys offer an ideal opportunity to reveal the influence of short and medium term landscape transformations on artefact assemblages. Similar long-term studies of landscape evolution have been carried out in neighbouring areas such as Acconia in Calabria (Ammerman et al. 2013), and have revealed substantial changes in Mediterranean landscapes and the associated archaeological record over even relatively short time periods. Our study contributes to this debate on the impact of landscape changes on survey datasets by assessing the effects of different time-intervals between surveys and by comparing resurveys in two very different landscape zones.

2. SURVEY METHODOLOGY

The methods used by the first generation of the survey record are described in Marchi and Sabbatini 1996; Marchi 2010b; Sabbatini 2001. Cf. Pelgrom et al. 2014 for Venosa, and in Stek et al. 2015 for Isernia. Succinctly said both projects applied a systematic site-survey, walking all accessible fields with teams but only collecting material from high find density areas ('sites').

The survey method applied in our LERC resurveys is instead a systematic off-site survey method, collecting all finds. The method is identical in both the Venosa and Isernia resurveys, and is fully described in Pelgrom and Stek 2010. Summarising, the method consists in surveying units of approx. 50 x 50 metres with surveyors spaced evenly at 10 metres, each one ideally covering a 2 metre wide strip of the terrain resulting in a coverage of 20%.

The surveyors were requested to collect any kind of archaeological material and store it separately for each unit. In the case of off-site collection the procedure is as follows. Each pottery collection is bagged indicating unit number, visit number and date. If a site within a unit (defined by a threshold of ≥5 sherds per sq. m)., was encountered during the survey of a unit, the pottery collection within the site boundaries was separated from the unit collection, and then bagged indicating that the materials come from a site context (S) and the corresponding unit name, i.e. 1297 S (see Pelgrom and Stek 2010 for a detailed discussion of this survey method).

In parallel, the survey teams also kept track of different parameters like modern constructions, land-use, coverage, geomorphology or visibility ratios, in order to record and assess possible biases in the survey caused by this complex set of variables (for a good discussion see Van Leusen 2002). The surveys were carried out after ploughing activities to minimise the effect of land use and vegetation in visibility. Since the territory of Venosa is oriented to dry agriculture, with most of the population traditionally concentrated in large towns (Compagna 1963, 80–104), visibility and accessibility were quite optimal. In contrast, the surroundings of Isernia are affected by strong urban expansion on one hand, while at the same time many agricultural plots are abandoned and currently covered by thick vegetation and ex-

panding forests (Acosta et al. 2005). Therefore only a small portion of the total territory could be surveyed by means of traditional field walking.

To assess the effect of resurveys we compare the different datasets quantitatively and qualitatively using the following process:

1. Comparing the number of sites grouped by size. A table helps to evaluate the behaviour of sites with different sizes. It is often assumed that small scatters are more affected by landscape changes (e.g. Wilson 2008). This affects for instance demographical reconstructions based on survey data. The results are discussed in section 4.
2. Using a Chi-square test (and Fisher's exact test) to assess the similarity of results of different surveys in the same areas, statistically speaking. The p-value helps to accept or reject a hypothesis of similarity in survey results (Drennan 2009, 182–88). For the case study of Venosa, where the surveys were performed by different teams, we propose three ways of studying site numbers by using standardized units (cf. below). In Isernia, the field data from previous surveys (2011-2013, referred to as 1st Survey) is better controlled and documented since it was carried out by the same project using aerial photos and GIS mapping, and the resurvey was done within a short period of time after the first survey. The off-site resurvey (2015, referred to as 2nd Survey) was therefore done using the same units as in the 1st survey and thus we could use a single aggregation system for the statistical test. Further details, discussion and interpretations are offered in section 5.
3. To summarize the previous points and to support our conclusions in section 5, we calculate how resurveys actually contribute to improving site gazetteers from surveyed areas. By doing so, it is possible to assess the impact of landscape transformations on recorded site patterns (re-discovering "old" and adding "new" sites).

2.1. *Research area: Venosa*

The zones investigated by the LERC team in the territory of Venosa are a sample of the whole area covered by the Forma Italiae team (directed by Marchi and Sabbatini). The most relevant areas for the overall project's concern of the Republican colonization in the area were selected to be re-surveyed with the method described in the previous section. Obviously, it was not possible to cover the entire territory previously explored by the Forma Italiae project due to time constraints.

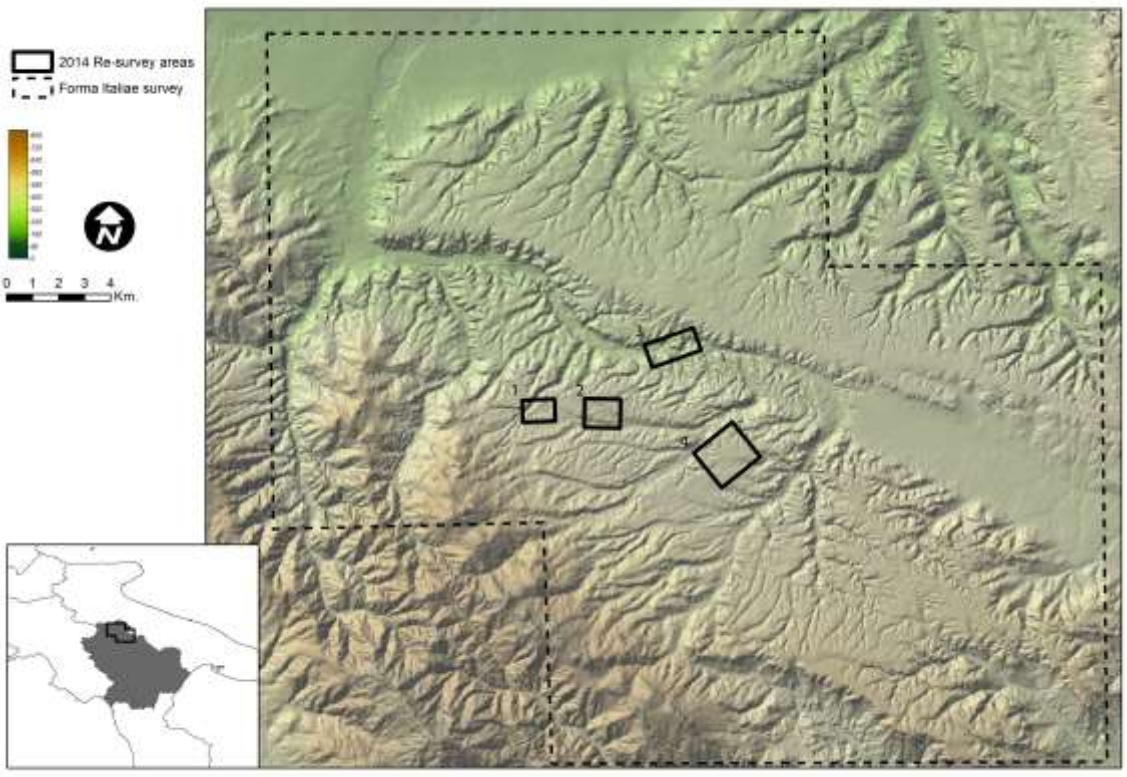

Figure 2. Re-survey areas in Venosa, 1. Masseria Bagnoli; 2. Contrada Valentino; 3. Bagnara; 4. Li Castellani

We selected the following areas (Figure 2): 1) Masseria Bagnoli/ Piano di Camera, in the plateau of the same name, located in the southern vicinity of modern Venosa and only separated from the city centre by the Vallone del Reale; 2) Contrada Valentino on the eastern side of the same plateau and alongside the Strada Statale 168; 3) Bagnara north-east of Venosa and alongside a stream of the river Fiumara and 4) Li Castellani, in between modern Venosa and Palazzo San Gervasio, an area with almost no known archaeology but relevant as a control zone.

The geomorphology in Basilicata has changed dramatically since Marchi and Sabbatini started their investigation of this territory in 1989. The land dedicated to Aglianico grape production has expanded considerably in the surroundings of Monte Vulture. A great volume of soil has been excavated to expose the volcanic horizon in order to plant vines. Moreover, other practices related to grape cultivation, such as the digging of basins for water storage, have also eliminated any possibility of re-detecting archaeological features. Regrettably, some of the sites detected by the surveyors of the Forma Italiae now exist only as legacy data and maps.

2.2. *Research area: Isernia*

The 2nd survey of the territory of the colony of Aesernia was carried out within a transect of 1 by 4 kilometres drawn north of the town according to the following research interests:

1. Regarding the historical discourse: the existence of a land division grid defined by Chouquer (Chouquer 1987: Aesernia I). Chouquer identifies the land division as belonging to the 3rd century BC, after the foundation of Aesernia in 263 BC.
2. Regarding field survey methodology: a detectability map created by the LERC team (Casarotto et al. 2017) for the extension of the original (2011-13) sampling universe (Stek et al. 2015). That map defines a series of strata according to the feasibility of site discovery, incorporating geological cartography, land use and erosion.

3. BARKER'S TRAFFIC LIGHTS: SITES LOCATION AND SIZE

This section analyses the information recovered by our fieldwork (LERC) and the GIS analysis of the Forma Italiae (FI) survey in the area. As mentioned above, the FI project aimed to map and describe sites as precisely as possible. Accordingly, the off-site data collection and the environmental documentation have not been published in detail (71030 ha). The LERC survey, in line with its smaller territorial scope, collected detailed information including land use, tillage, visibility, off-site and intra-site material collections, as well as the spatial geometry of surveyed fields for analytical and visualization purposes.

For the Isernia case study we can compare our own datasets from the 1st site survey against the 2nd offsite approach on the selected transect to the north of the modern city. Thus, we will be able to assess the reliability of the methodology for site detection in correspondence to the offsite collections. We can also assess whether offsite collections can be used to study areas distorted by natural transformations of the landscape (Schiffer 1987). The surveyed units will serve as a comparative framework to assess differences between legacy evidence (Forma Italiae and LERC 1st survey) and the LERC surveys (at both Venosa and Isernia).

Table 1 shows a strong decrease in the site discovery rate in the LERC survey in Contrada Valentino at Venosa. The smallest sites (<200 sq. m.) are the most affected category (from 13 to 3 recognised sites in the resurvey), while the rest of the categories are more stable. The lower number of small sites can partly be explained by the higher number of medium sized sites (200-600 sq. m). In the area of Bagnoli the LERC survey discovered 6 sites, 3 (50%) of them in the first size group (0-200 sq. m.). A feasible explanation for the appearance of such new small sites is to consider them as ephemeral traces of human activity in the landscape like graves or miscellaneous small dwelling areas. The existence of alternate types of sites that we cannot now comprehend is also worth mentioning (Alcock and Rempel 2006).

It is possible that some of these small sites had appeared once (not as an ephemeral event, but as a consequence of a long-term process of destruction) on the surface record and were luckily recorded by the FI survey, and later on were destroyed by a variety of anthropic effects (associated with agriculture and farming practices). 20 years later, in the autumn of 2014, the LERC survey was lucky enough to record some new small sites, that will possibly be destroyed in the near future or whose footprint will be smoothed until disappearing among the background noise (Gallant 1986). This phenomenon was already elegantly described by Lloyd and Barker (1981: 291) with the expression 'traffic lights'.

Bigger sites (>1000 sq. m.) are more easily identifiable and remain visible in the surface record. Some exceptions can be made such as AV101 and AV103 in Contrada Valentino, that were not mapped by the FI despite their large size; on the other hand the FI discovered site 202 (1000-1200 sq. m) which the LERC survey did not detect due to the destructive effects of vineyard cultivation.

Similar results from Li Castellani reaffirm the image of this area as a good example of landscape stability. Two sites (AV201 and AV202) correspond to FI 524. On the other hand, as an example of this process of continuous deterioration of the surface record, FI 525, interpreted by Marchi and Sabbatini (1996, 88) as part of a brick factory, together with FI 525 has now disappeared.

Moving to the hinterland of Isernia, the re-survey yielded similar results, 5 small sites (0-200 sq. m) were found, and we consider it relevant to stress that 4 out of these 5 are smaller than 50 sq. m.

At the other extreme of the site ranking (1000-1200 sq. m.) only one site was detected. It corresponds to the bigger site found in the first visit (A225). This site is a very conspicuous site that has been studied by other techniques such as point sampling and geophysical survey. Most of the differences and disparities of the 1st survey versus the 2nd survey happen in the area of the nucleated sites A224/A115 and A226. In this case the low visibility and land use are the main causes of the change in size.

The examination of site sizes (Table 1) and spatial positions, together with the reference of field plots (Figure 2), might contribute to ascertaining the causes of such differences and, if possible, allow us to assess whether off-site re-survey is able to increase our knowledge of the settlement pattern. We identify three possible sets of causes for the differences between the legacy data and re-survey results:

1. Causes related to changes in land use: chiefly, it is possible that we could not replicate the original site position as mapped by the FI project because of formation process effects (Schiffer 1987) like ploughing, land use change, land reclamation, viticulture, urbanization, etc.
2. Causes related to technical issues occurring during the first survey: i.e. drawing sites accurately with the technology available at the time of the survey and/or the different scale of employed cartography.
3. Causes related to problems in the practical managing of the legacy data: i.e., differences among FI-LERC site locations could be an effect of the process of digitization (this latter point refers also back to the issue of cartographic scale).

We encounter biases related to these three scenarios. There is a combination of factors that prevent us from obtaining exactly similar results to those obtained by the Forma Italiae team several decades ago. The maps of different survey areas around Venosa (Figure 2) display the presence and absence of sites (both LERC and FI) using field plots. The visualization provides an insight into the main differences in survey results and the possible implications of taphonomic processes. In Bagnoli, the large size of the field plots contributes to a picture of homogeneity in the results. In that sense, the lack of landscape transformation of the area, (which is regularly dedicated to dry crops like wheat) has permitted us to obtain similar results. The cultivation of vineyards in some units classified as "FI sites only" has contributed to the disappearance of once-nucleated pottery scatters as recognizable entities. Further studies in the off-site pottery collection aim to help revealing the presence of site footprint proxies and therefore track disappeared sites.

The LERC site BGN06 in Bagnoli was recorded in 2014 as a clear and isolated nucleus with stones and building material with very clear site boundaries. We can assume the site has not been ploughed out; otherwise the materials might appear more scattered and not nucleated as they are. It is unlikely that FI surveyors missed that site, in fact they recorded FI site 190 at the very edge of the plateau, approx. 40 m. from the centroid of LERC's "equivalent" BGN06. That indicates possible mistakes in georeferencing or digitalizing, again raising issues for the straightforward use of legacy data.

Further comparison of legacy and re-survey data shows that FI 524 and LERC AV201-2 are equivalent in their spatial location. Maybe a combination of the three proposed scenarios could be argued in this case.

The area of Bagnara, close to the Venosa town centre, is highly disturbed, which has resulted in the disappearance of many sites, but also the appearance of several new sites of small size due to ploughing activity. As we explained, we would expect these to be smoothened by the effect of ploughing after some years.

In Contrada Valentino the legacy data reports 8 sites (AV281-287) that LERC was unable to redetect. Just to the west of the unit where those sites were supposed to be, an irrigation basin was dug out, altering the remains of these sites. The impression is that the Contrada Valentino area has suffered drastic changes which contributed to the disappearance of many sites, but also to the appearance of new small ones.

In contrast with the previous changeable areas, Li Castellani appears as a highly stable landscape. It is empty of archaeology with the exception of two small sites found in the same plot but which have slightly shifted. That was the situation described by the Forma Italiae team and verified by the LERC re-survey.

The next analytical step, testing presence and absence of sites by unit, helps to overcome the problem of cartographical mistakes.

Table 1. Sites discovered by Forma Italiae and LERC surveys, count by size range (sq. m).

	Site Size (sq. m.)								
	0-200	200-400	400-600	600-800	800-1000	1000-1200	1200-1400	2000-2200	Total
Bagnara									
FI	12				1				13
LERC	5	6	4				1	1	17
Bagnoli									
FI		1	1	1	1	1			5
LERC	3			2	1				6
Li Castellani									
FI	1				1				2
LERC			1		1				2
Contrada Valentino									
FI	13	2	1						16
LERC	3	1		1		1			7
Isernia									
1st Survey	1		2	3		1	1		8
2nd Survey	5	3	1			1			10

4. EXPERIMENT COMPARISON OF SURVEY RESULTS

4.1. Forma Italiae vs. LERC survey results in Venosa

The Forma Italiae survey aimed to detect and map archaeological sites. The final output was a series of printed maps, using the Carta Tecnica Regionale (CTR), with points of different size according to the annotations of surveyors and in some cases these sites were mapped with the help of survey equipment such as a dGPS. In order to convert this legacy data into our GIS system and make it comparable to the LERC datasets we digitized FI site boundaries as polygons. We obtained comparable information to summarize the absence or presence of sites by fields or by other type of aggregation geometry. However, it may be useful to bear in mind Witcher's statement (2008) that "digitizing legacy data does not make surveys comparable". We need to find a way to make this comparison significant.

As has been explained beforehand, there is no information available about recording units used by the Forma Italiae team, thus we propose an experimental approach to test the consistency and feasibility of the statistical test. By doing so, we will evaluate whether the chosen aggregation units (to summarize the presence or absence of sites) influence the results.

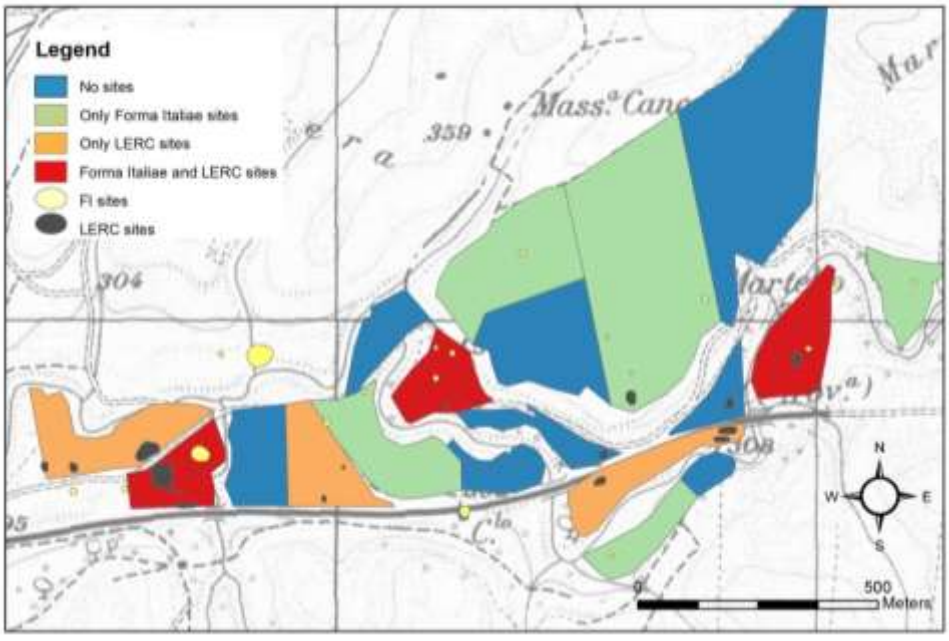

Figure 3. Occurrence of survey sites in respectively the FI survey and the LERC resurvey in the Bagnara area.

The first comparison of the FI legacy data and the LERC data was carried out using the same field units drawn by the former survey during the fieldwork. As described in section 2 these units are expected to be 50 by 50 meters or as homogeneous as possible. On occasion, size and shape are conditioned by the shape of the agricultural plots and these are expected to be more sensitive to extreme (unexpected) displacement of material or errors ascribable to mapping processes.

Secondly, the same process of contrasting FI sites versus LERC sites presence can be done using an artificial grid of 100 by 100 m. The square grid was randomly drawn, and both Forma Italiae and LERC sites were counted for each cell, then similar statistical analysis was performed.

A third analytical possibility is to employ modern field plots as aggregation units for the qualitative comparison of FI legacy data and LERC re-survey results. By doing so we might be able to detect modern formation processes related to agricultural activities, which take place in the context of regular exploitation of each plot.

Ploughing is the main factor provoking alterations of surface and subsurface assemblages (Tol 2012). Nevertheless, if such a destruction has happened within the geometry of the same plot, the LERC survey should be able to locate these sites, regardless of the movement of the material.

The famous Barker analogy (Lloyd and Barker 1981) of sites coming on and off "as traffic lights in different soil, vegetation and survey conditions" is applicable in three aspects: soil destruction, viticulture and survey method.

The results for each of these three experimental approaches (LERC units, 100 x100 cells and modern plots) are displayed together in Table 2.

The Chi-square analysis (Table 2) of FI vs. LERC sites within units demonstrates that only survey results from Li Castellani are comparable ($p < 0.05$).

Survey results from Bagnara, Bagnoli and Contrada Valentino are significantly different ($p > 0.05$) in the three tests using different aggregation units. Our comparison of the survey data sets shows noteworthy changes in both site numbers and site location in these areas. Whether this is the result of landscape changes alone, or is also affected by methodological biases, is difficult to establish.

Landscape changes can be traced by means of aerial photography. Basilicata and Molise are good areas to prove the potential of remote sensing and legacy data since the operations of the Second World War left a considerable amount of imagery (Cantoro et al. 2016). Thanks to these images we can observe the dynamics occurring in two specific cases. In Contrada Valentino, where the small properties merge into large field units, leading to a change in land use and field boundaries followed by intensification of dry farming and ploughing with modern means, which eventually leads to the destruction of surface and subsurface archaeological evidence. In Bagnoli, the main human effect consists in the massive change of dray agriculture to viticulture, leading to the destruction of the surface in order to plant vines directly in the volcanic bedrock.

Considering the statistical results of Li Castellani and the landscape stability observed in that area, we can assume that landscape changes are a remarkable covariant in the evaluation of survey methodologies.

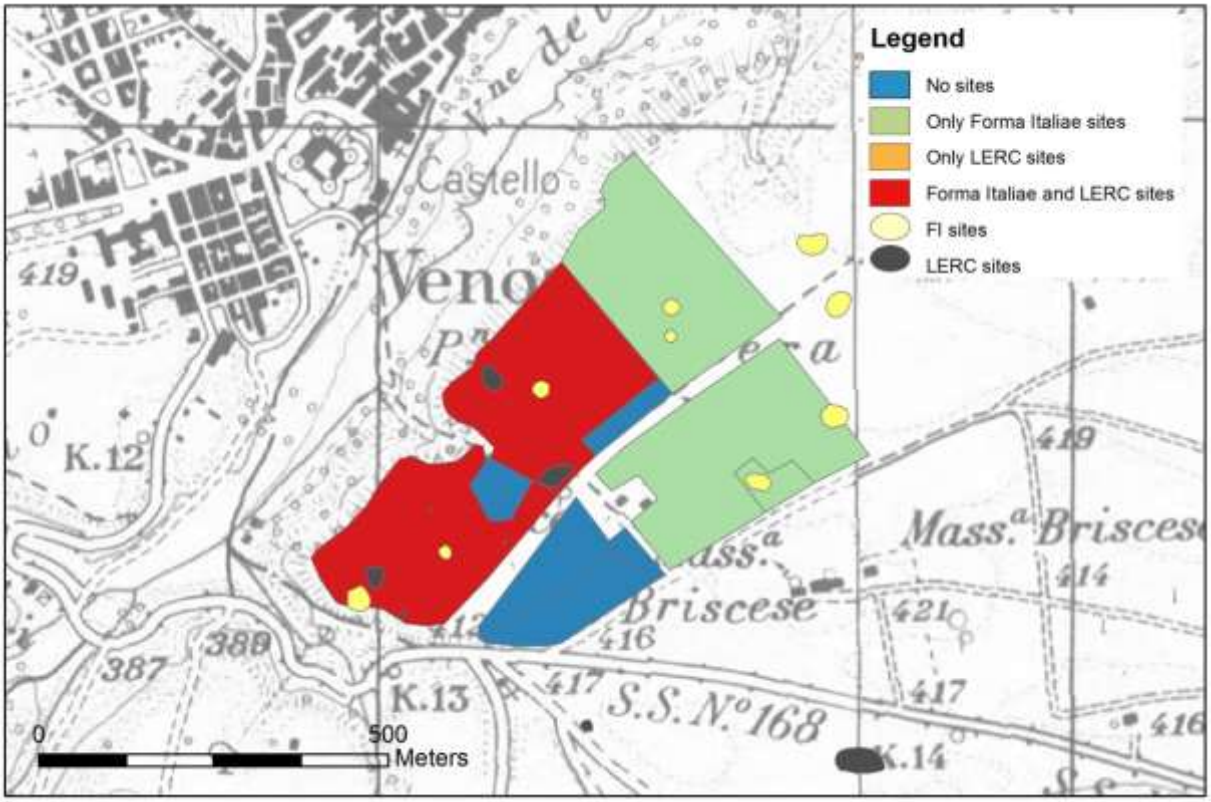

Figure 4. Occurrence of survey sites mapped by respectively the FI survey and the LERC resurvey in the Bagnoli area.

Figure 5. Occurrence of survey sites mapped by the FI project and the LERC resurvey per field in Li Castellani.

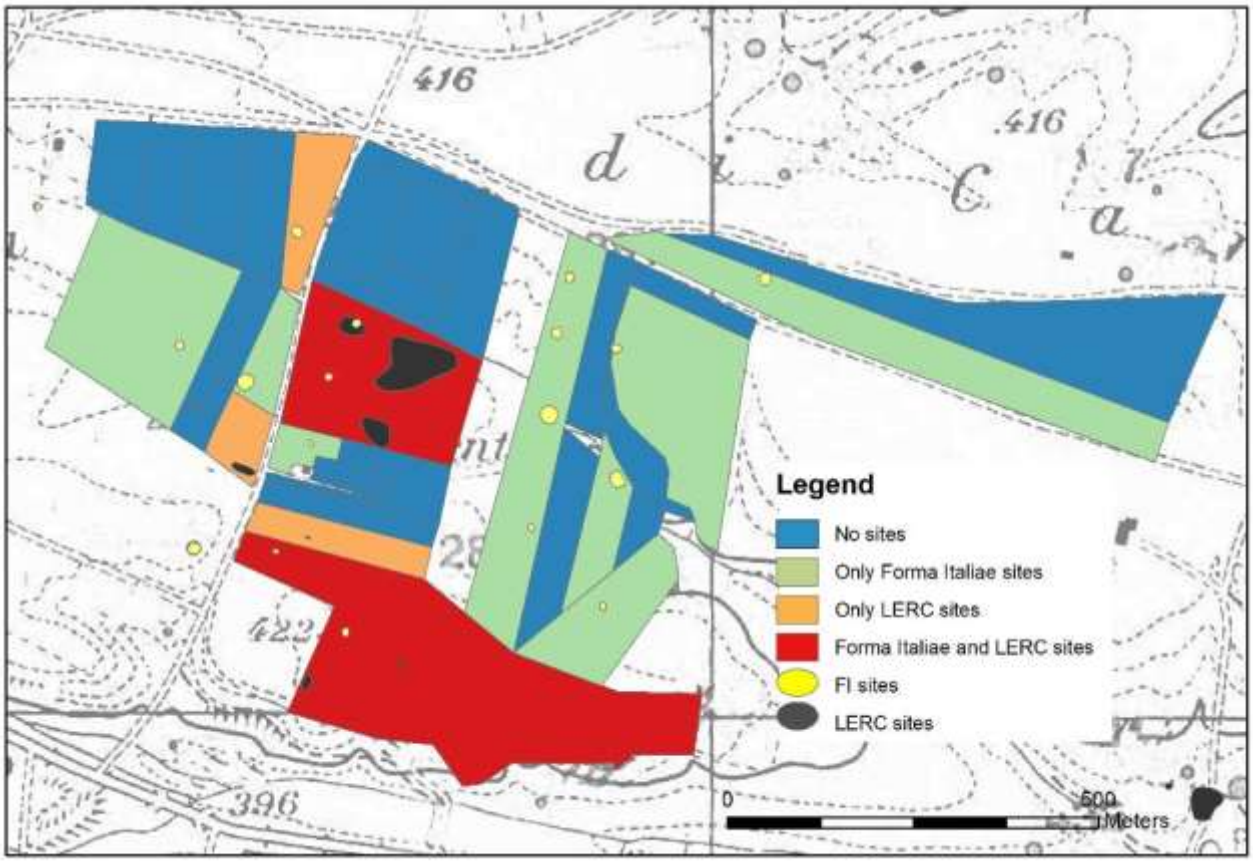

Figure 6. Occurrence of Forma Italiae's and CLP's survey sites by field in Contrada Valentino.

Figure 7. Landscape change in Contrada Valentino from 1953 (right) to 2015 (left).

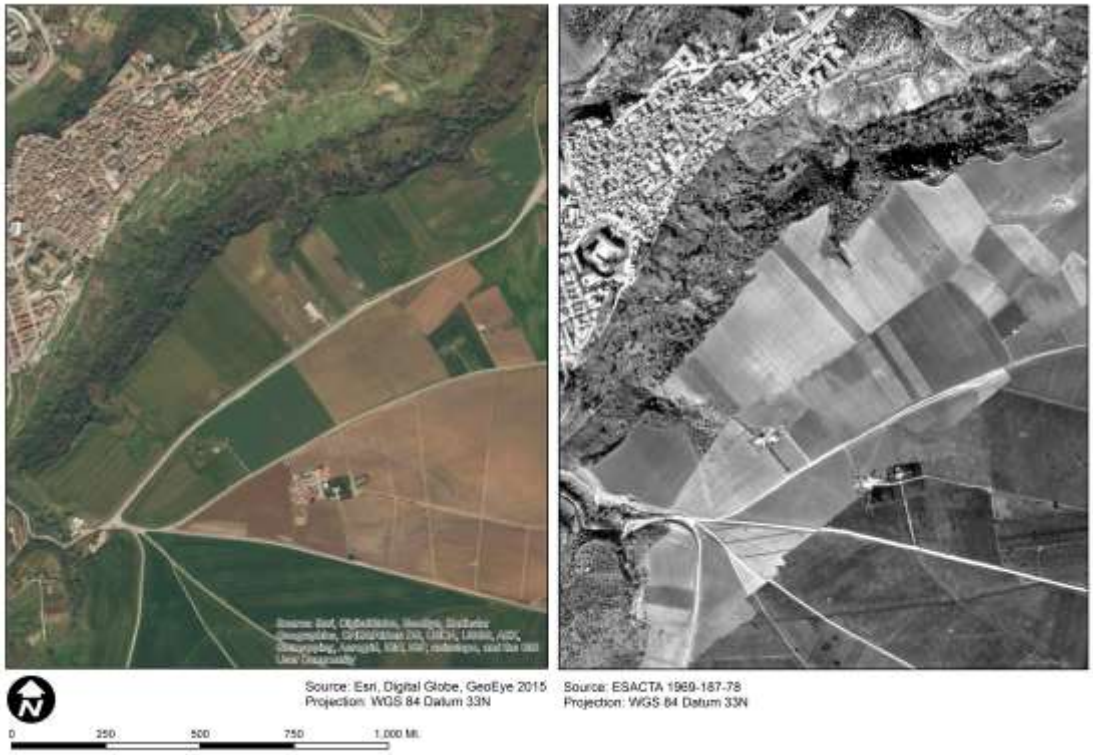

Figure 8. Landscape change in Bagnoli. From 1969 (right) to 2015 (left)

Table 2, Chi-square results for the Venosa area comparison of FI and LERC results. First, Chi-sq. results LERC units; Second, Chi-sq. results 100x100 cells; Third, Chi-sq. results field plots.

		1st Experiment		2nd Experiment		3rd Experiment	
		Count by LERC units		Count by 100 m side cells		Count by Field	
Zone	df	X^2	P value.	X2	P value	X2	P value
Bagnoli	1	1.01	0.313	0.295	0.672	4.2	0.107
Bagnara	1	0.021	0.886	0.692	0.518	0.505	0.631
Li Castellani	1	27.82	0	147.3	0	38	0.026
Contrada Valentino	1	1.25	0.262	0.231	0.723	0.757	0.432

4.2. COMPARING *LERC* SURVEYS IN ISERNIA

A Chi-Square analysis was also executed for the whole selected transect area north of the colony of Isernia. For this study case, we compare on the basis of the LERC survey units (ca. 50 x 50 sq. m as described in section 2).

The main difference from the analysis of the Venosa legacy data, is the similarities in the LERC field-walking process during both site and off-site resurvey, and the recording of metadata to reconstruct the conditions in which the survey was carried out. Moreover, relatively few changes had occurred in the Isernia's landscape from the 1st survey (2011-2013) to the moment of the 2nd offsite re-survey (2015).

The results of the Chi-square test (Fisher exact test) are the following: X2= 92.095 (1 df), p<0.01 (Table 3). The obtained results can be considered highly significant. We can accept the similarity of site discovery efficiency in both surveys. There are no differences in the overall result due to re-survey carried out in different years.

The survey of the selected transect allowed us to survey 575 units over an area of 89 ha representing 22.5 % of the sample area. The coverage of the area during the survey was slightly better than the coverage achieved by the 1st survey, mostly due to changes in tillage and the possibility to access some unexplored areas.

Thanks to the detailed field documentation of ground visibility and the remarks by the team leaders , we can reconstruct the conditions of the 1st sur-

vey and assess the natural causes and human actions (if any) behind the non-detection of some sites that were later discovered by 2nd survey. The survey detected all the sites discovered during the 1st survey except A223 and A226. Site A223 was also not unambiguous to the surveyors who discovered it the first time. In fact it was reported as a remarkable concentration of approx. 5 sherds per sq. m. but without clear boundaries. A226 was not spotted due to the bad visibility in the field, which was fallow and overgrown during the survey.

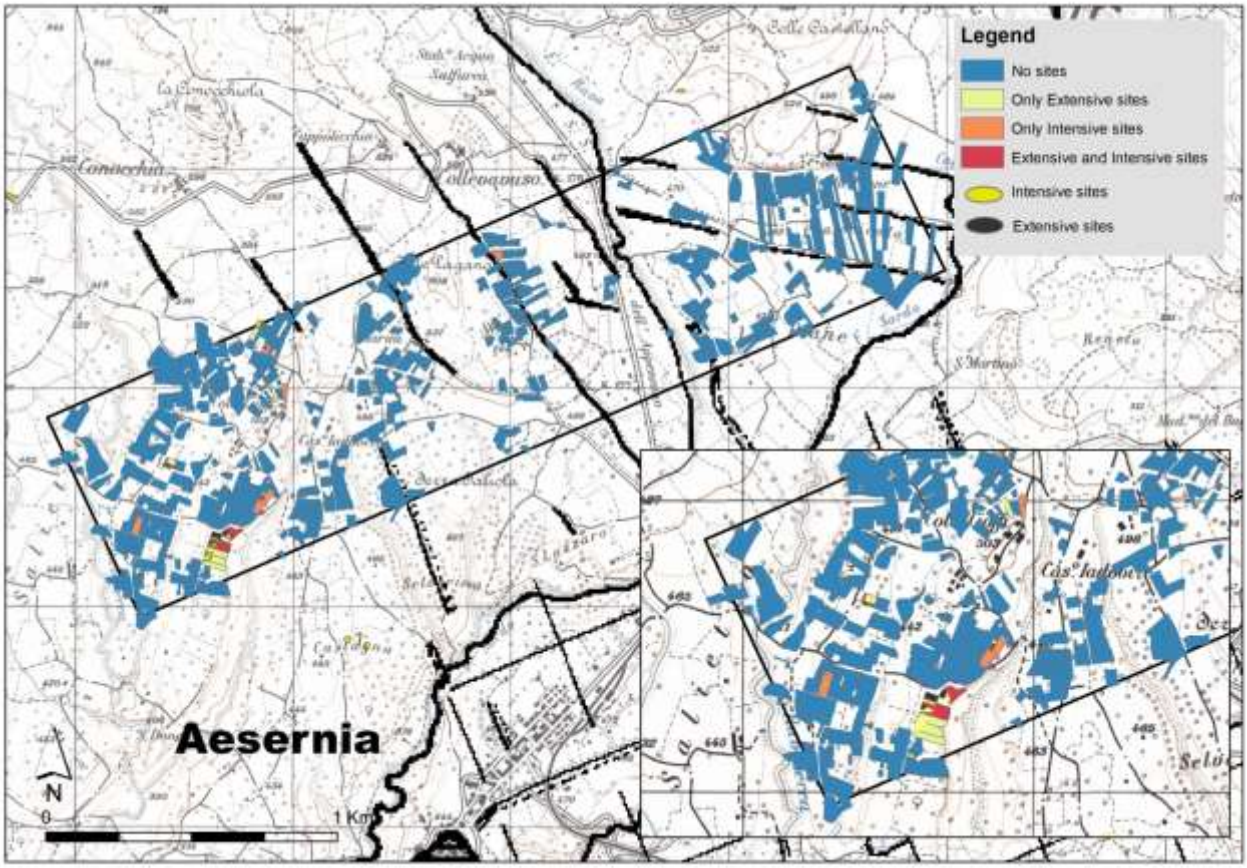

Figure 9. Survey transect in Isernia, with indication of possible land division as proposed by Chouquer 1987.

Table 3. Chi-square test for Isernia survey

Count by LERC units			
Zone	df	X^2	P value.
Isernia	1	92,095	0,00

The newly discovered sites are the following: A139 is a medium-sized concentration of building material, with some *dolium* fragments but without fine wares. It is located on a gentle slope north of Colle Cioffi and the chronology is undoubtedly Roman. The area was surveyed first in 2013, when the surveyors reported Material Presence 3 (in a scale of 1-very low density, to 5-high density) and Final Visibility of 4 with medium ploughed. They interpreted the density as a product of erosion. Considering the (≥ 5 sherds/ sq. m) density threshold it should be considered as a site despite the patchy finds.

A140 is a very small site close to A139, it is difficult to interpret because no fine wares were detected, but again, the surface scatter meets the density requirements to call it a site. The unit where the site was found was not surveyed during the 1st survey because of its bad visibility and the absence of tillage.

A142 is a medium-size site with lots of building material fragments (tile and building material debris) and stones, as well as impasto, *dolium* and other coarse ware pottery. Only a sample of the different fabrics of brick and tiles and impasto was collected as diagnostic. Coarse and plain ware, and a considerable amount of black gloss was present. The offsite material is also comparable to what we found within the site boundaries. This unit was not surveyed during the 1st survey, and was marked as "temporary lack of visibility".

A143 site is located 80 metres east of the small site A135, which is on the very same slope and it was identified during the 1st survey. Nevertheless the 2nd survey did not recognize it as a site.

Two sites are situated 200 metres north of site A143, these are A139 and A140. The visibility in the corresponding survey unit was uniform and because

the site boundaries were always recorded within the unit, we can assume that we have documented the size of the site accurately.

Site A144 was found on the western slope of Colle Pagano, adjacent to one of the axes of the proposed land division system as reconstructed by Chouquer (1987). Nevertheless, the material recovered does not point to a Republican phase, but to a mid-Imperial or Late Roman settlement. The collection consists mostly of tiles and building material (*opus spicatum* bricks) and some fragments of African Red Slip Ware.

Apart from mentioned sites, a point of interest (POI) 4028 was found in the flat area of Le Piane, at the North-East edge of the survey transect.

Table 4. The impact of re-surveys (by area) on the datasets

		Total sites	Contribution to total	Exact Matches	Possible matches	New sites	Impact of LERC survey
Bagnara		30		0	2	15	
FI	13		43.33				
LERC	17		56.67				**115.38**
Bagnoli		11		0	2	4	
FI	5		45.45				
LERC	6		54.55				**80.00**
Castellani		4		0	2	0	
FI	2		50.00				
LERC	2		50.00				0.00
Contrada Valentino		23		1	0	6	
FI	16		69.57				
LERC	7		30.43				37.50
Isernia		18		4	0	6	
1st Survey	8		44.44				
2nd Survey	10		55.56				**75.00**

5. CONCLUSIONS: THE IMPACT OF RE-SURVEYS

Table 4 summarizes the number of sites retrieved by each survey, first survey (FI and LERC) and LERC off-site collection re-surveys. It reflects the total number of sites we counted, the contribution of each survey to the total number of sites, and three columns reporting the matches between surveys. The impact factor is calculated as the percentage of new LERC sites over the total number of sites discovered by the (both FI and LERC) surveys in Isernia and Venosa.

The table shows that despite the positive contribution to site numbers of resurveys in most areas, the resurveying actually only causes a noteworthy increase in the total number of sites in the Bagnara area (Venosa). In other survey areas like Bagnoli (Venosa) and the whole Isernia sample, the resurveys have proven to be a valid tool for increasing our knowledge of the settlement pattern, but without huge differences. Li Castellani appears as an example of stability.

On the other hand, the destruction of the archaeological landscape in Contrada Valentino is evident in the proportionally lower number of sites retrieved by the LERC resurvey around Venosa, despite the discovery of some new small ones.

In sum, from the combined analysis, we conclude that re-surveys reveal quite substantial differences in the location, and sometimes also in the number, of sites.

For the Venosa area, we are in the position, thanks to aerial imagery from the period that the Marchi surveys took place, to explain the difference between original and resurveys as an effect of (sometimes incisive) landscape changes. However, sometimes the effect of different mapping procedures cannot be excluded.

For the Isernia area, we have almost complete control over mapping issues. Here, we can establish with certainty that massive landscape mid and long term changes of the type seen in Venosa cannot account for the documented differences. Some of the differences in the Isernia area are better explained by *temporary* changes in land use, vegetation and accessibility of fields.

The consequential considerations for future directions are twofold. First, the relative large differences found on the scale of analysis applied here, raises the

question as to how this translates to larger scales of analysis (in terms of geography and site numbers/densities) and larger temporal scales between different surveys. Second, the comparison between the effects observed here in terms of site presence or not on the one hand, with the character of the offsite assemblages of the LERC surveys on the other may shed light on the processes of exposing and consequent disappearing of ephemeral sites.

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