Utilizing Crowdsourced Georeferenced Photography for Identification and Prioritization of Areas for Scenic Conservation

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Abstract

This paper discusses a method of identifying and prioritizing areas for scenic conservation using crowdsourced georeferenced photos. Building on previous studies (STILGOE 1984; CHENOWETH 1984, HOCHMAIR 2010, SUGIMOTO 2011, ALIVAND & HOCHMAIR 2013), photos crowdsourced from visitors and on-line digital repositories are a powerful and appropriate tool for identifying areas of scenic interest. Given the limited resources available for conservation planning in some regions, collecting a wide range of views helps prioritization of conservation efforts. The Loyalsock hiking trail in North-Central Pennsylvania serves as a case study for implementation of this method.

1 Introduction

In Pennsylvania, the drilling and associated development of the Marcellus shale gas boom are not only impacting or transforming the politics, the economy, and the environment, but also transforming visual quality of some of the regions in which this activity is occurring.

North-central Pennsylvania, a landscape known for its pristine woodlands, rolling mountain ranges, rugged trails, glistening streams, and bucolic farmland, are at risk of aesthetic degradation. Factors that contribute to the possible degradation of these amenities include, but are not limited to, the siting, forest clearing, and landform grading for well pads, construction of new roads or widening of existing infrastructure for well site access and maintenance, and linear clear-cutting and grading for the installation of pipelines and the long-term maintenance of pipelines right-of-ways.

It is very important to conserve the rural and natural character of the landscape. If these areas are neglected and unchecked development is allowed to occur, they will lose the aesthetic appeal for which they are known and no longer be an asset to the region. While shale gas extraction has provided for a recent upturn in the local economy for some, (CONSIDINE, WATSON & BLUMSACK 2010) royalties for individual wells begin to decline immediately as the pressure in the formation drops and the well produces less (BARTLOW 2011, Geology.com 2012). When the shale gas boom ends, the region will need to find other sources of economic revenue − for tourism, second-homes and outdoor recreation to contribute to the economy, the basic resource on which they depend, the scenic landscape, must be conserved. The focus of this study is on the visual impacts of the Marcellus shale gas industry. It does not look at the environmental or economic impacts, though these factors may be closely interrelated.

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Residents and visitors of these areas expect the landscape to appear untouched by humans, in pristine condition or only show minimal human impact such as elements representative of the agricultural cultural landscape or the forestry industrial history.

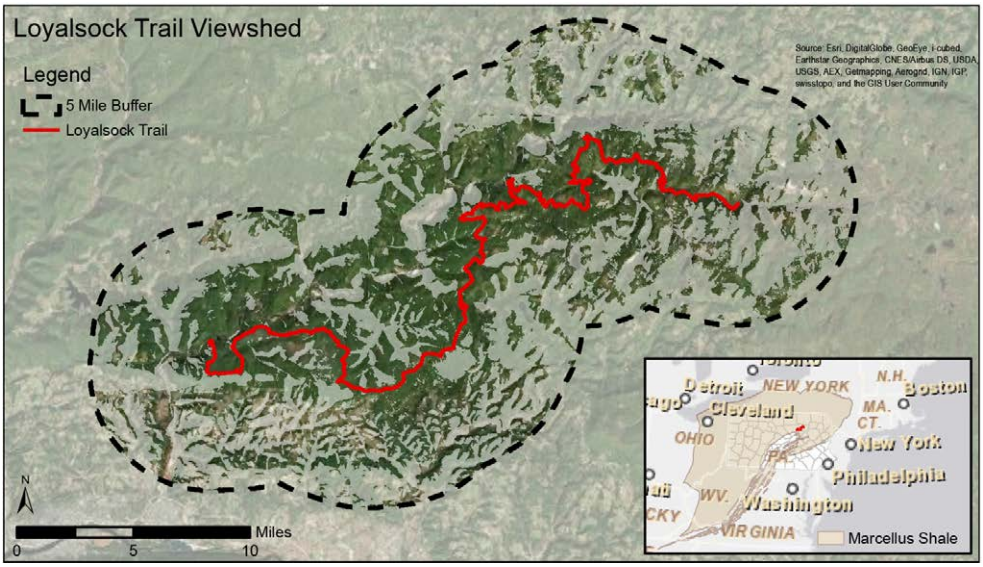

Fig. 1: The Loyalsock Trail viewshed in relation to the Marcellus shale formation at State scale

This paper looks at a case study using a method of utilizing crowdsourced data for identification and prioritization of scenic conservation. The focus is the viewshed of the Loyalsock Trail (Figure 1), a 60-mile-long, rustic, historic hiking trail in North-Central Pennsylvania.

Within a five mile radius of the Loyalsock Trail, the viewshed covers more than 113,743 acres of land, a considerable area of land to be dealt with as an aggregated whole. Rather than creating a viewshed protection ordinance that covers every bit of land seen from the trail, which would require compliance of many municipalities and two counties to enforce, one proposal is to look at the viewsheds of individual points of interest and prioritize them according to their scenic importance using crowdsourced photography.

2 Data Gathering

2.1 Identifying Points of Interest

This study uses crowdsourced, georeferenced photos that are publicly available on Google Earth™ to identify points of interest. As in previous studies (STILGOE 1984, CHENOWETH 1984, HOCHMAIR 2010, SUGIMOTO 2011, ALIVAND & HOCHMAIR 2013), photos crowdsourced from visitors and on-line digital repositories are a powerful and appropriate tool for identifying areas of scenic interest. With the digitized trail in place on Google Earth™, and the "Photos" layer turned on, one is able to begin identifying points of interest as clusters of photos taken from, or within close proximity to, the trail.

2.2 Google Earth™ and Image Clusters

Depending on the scale at which a user is viewing a map in Google Earth™, icons of individual or clusters of photos will appear when the Photo layer is turned on. The further the map is zoomed out the more likely there are to be clusters and the further the map is zoomed in the more likely there are to be individual photos. There are multiple sizes of photo icons in Google Earth™. The single photo icon represents a single image taken at a location. Here, the medium-sized cluster icon represents 2-29 photos taken at a location and the large cluster icon represents 30+ photos taken at a location (Figure 2). Hovering over

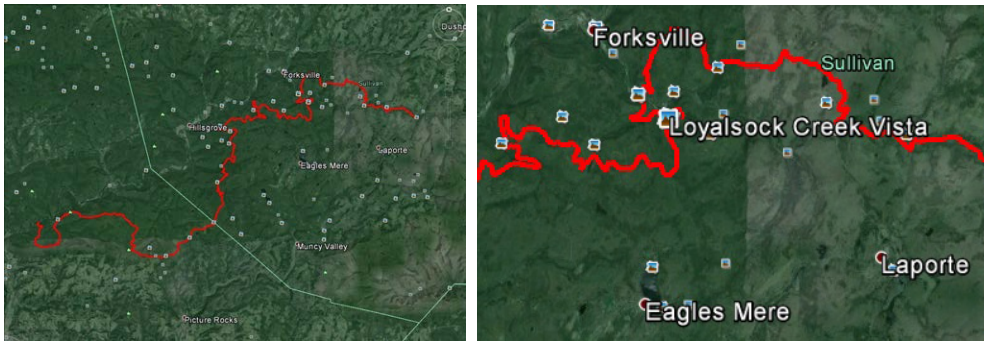

Fig. 2: Google Earth™ with Digitized Loyalsock Trail and Photos Layer turned on (accessed: 5/28/2014); Three different sizes of photo icons; Loyalsock Creek Vista is a large cluster icon indicating 30+ photos taken at that location (accessed: 5/28/2014)

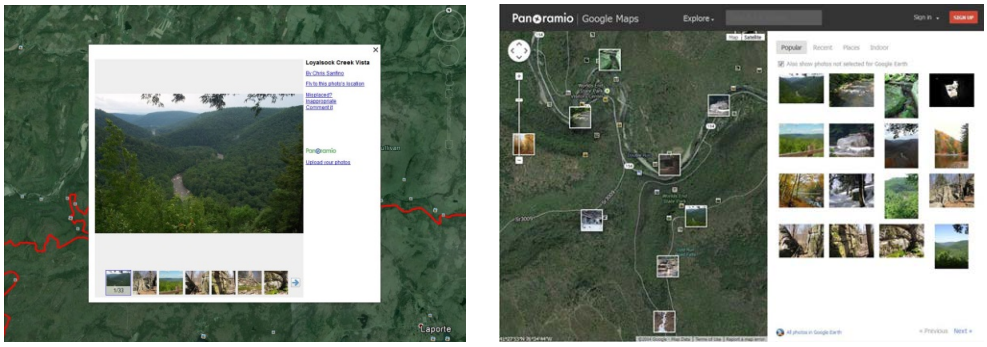

Fig. 3: Pop-up window showing all 33 photos represented in the cluster icon leading with the most viewed image (accessed: 5/28/2014); Panoramio™ Interface World's End State Park area, option chosen for all images, even those not selected for Google Earth™, and all photos sorted by popularity (accessed: 5/28/2014)

the large icon with the cursor indicates that the most popular photo in this cluster is the Loyalsock Creek Vista and that this is a popular location for taking photos. It does not, however, immediately indicate that the Loyalsock Creek Vista is the most photographed

thing in that location. It simply means in that location, within that cluster of photos, this photo is the most viewed on the internet. This particular icon is representing 43 photographs taken in this location at this scale and 18 of those photographs are of the Loyalsock Creek Vista, also known as the Canyon Vista at Worlds End State Park.

Zooming in to the Canyon Vista area one can see that it is still a very popular location for photography. The icon is still large, and of you click on it, a window opens (Figure 3) showing that it represents 33 photos. All 18 photos of the Canyon Vista are still present in this cluster, meaning that more than half of the photos taken at this location are of the Canyon Vista.

2.3 Panoramio™, Photo Popularity, and Photo Metadata

Google Earth™ uses Panoramio™ (www.Panoramio.com) to host the images it displays on its maps (Figure 3). Switching to the Panoramio™ interface, the user sees the photos of a particular area in greater detail. Larger photo icons appear for more popular photos and smaller icons for less viewed images. Here the user is given sorting options (by popularity, recent, places, or indoor) and is also offered the option of viewing photos that are not shown in Google Earth™. For this study, all available photos were viewed and they were sorted by popularity. Clicking on the image icon on the map or in the chart on the right takes the user to another section of Panoramio™ that hosts the metadata for that specific image. The metadata included show who posted the photo (as an online username), when it was posted, where it was taken (either automatically georeferenced by the photographic device or added manually by the author), and how many external views the image has had since it was posted. As of May 2014, the "Loyalsock Creek Vista" image, posted July 17th, 2007, by contributor Chris Sanfino, had 14,800+ views.

3 Methods

3.1 Ranking Points of Interest

Points of interest were chosen by identifying locations on or near the trail that had more than one image associated with them. This shows that there is interest from hikers and sightseers in this location (Figure 4). From there, the most viewed photo (from World's End Trail Vista N=269 views up to Canyon Vista N=14,382 views; see Figure 5) was chosen from within that image cluster for comparison. These views indicate that not only are people who are visiting these locations finding them valuable but also that a large number of people online are also interested in viewing them.

3.2 Total Number of Views Versus Averaged Views per Day

Choosing to rank the locations by the total number of views would be one method of determining the importance for conservation. However, the issue exists that some of these photos have been online far longer than others and will have had more time to be viewed.

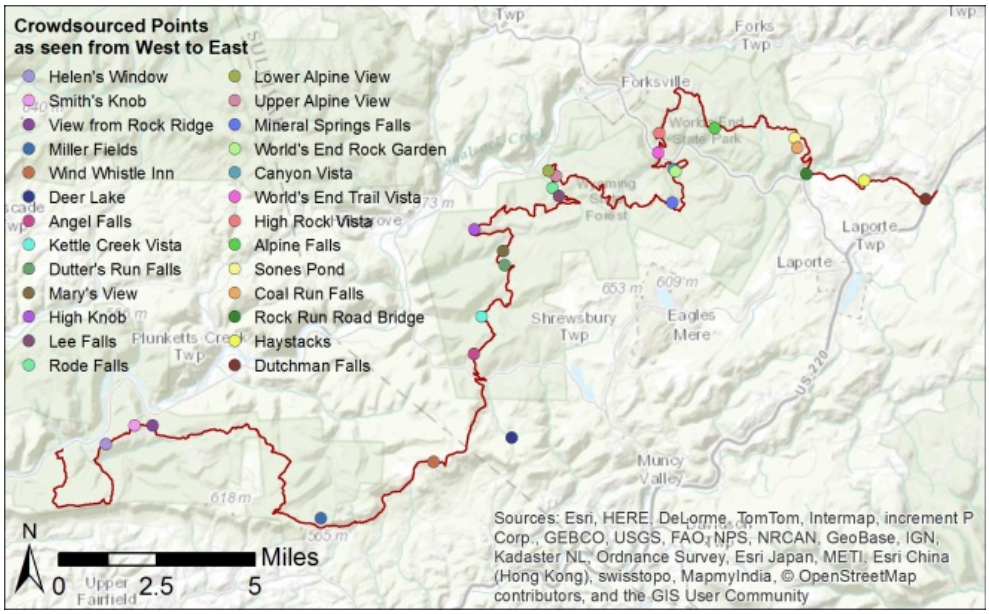

Fig. 4: Crowdsourced points as seen from West to East

For this reason, I chose to standardize the data by determining the average views per day the photo was receiving since it had been posted. This was done by taking the total number of views and dividing by the number of days it had been online. While there is some variance among the most viewed locations and those with the most views per day, three of the top four are the same in both. To look at it another way, values 1 through 26 were assigned to each location, 1 being the most popular and 26 being the least popular, for both methods and averaged those popularity ratings. The top five of the most viewed and averaged popularities are the same and the top three of the views per day and averaged popularities are the same. Regardless of the method, there is a strong positive correlation among the most popular and among the least popular of the chosen locations. For this study, the views per day will be the ordering method.

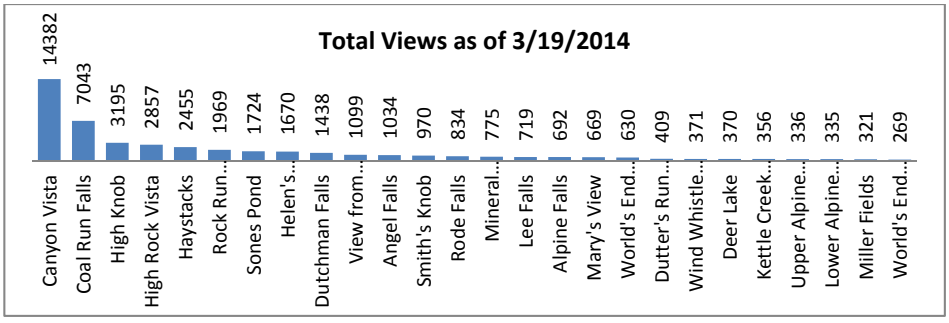

Fig. 5: Total number of views shown in Panoramio™ metadata as of March 19th, 2014

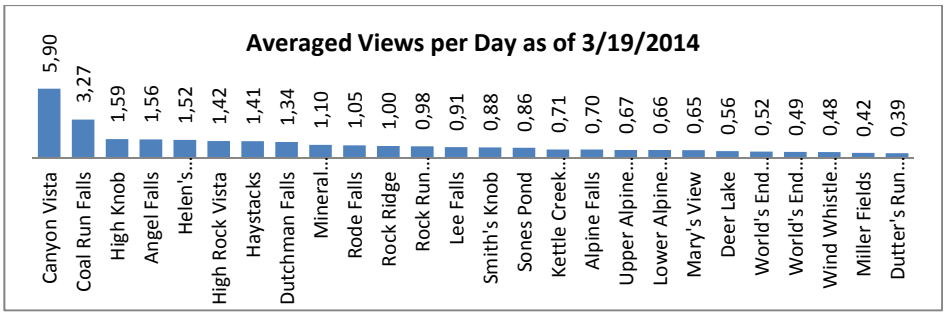

Fig. 6: Averaged views per day as of March 19th, 2014

4 Results

Having established an order of importance with the crowdsourced data, views can be protected as time and funds allow and efforts can be concentrated around those more important to the visual experience of the trail and region. This also means that individual municipalities can decide to which areas of conservation they will contribute, though in some cases it would still be necessary for multiple municipalities to band together to protect an entire point of interest's viewshed. Figure 7 shows the points of interest ranked by views per day.

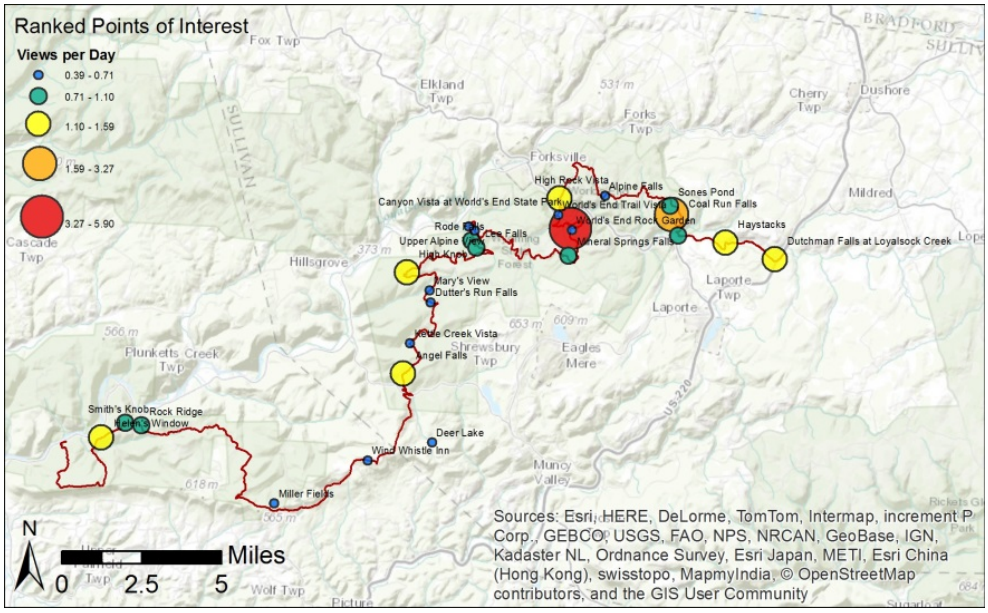

Fig. 7: Points of interest ranked by views per day

5 Conclusion and Outlook

Figure 8 shows only the viewsheds of the top four most popular locations, a more conservative approach to scenic conservation in this region. This smaller area may be an easier goal to attain or the first step in a multi-phase conservation design.

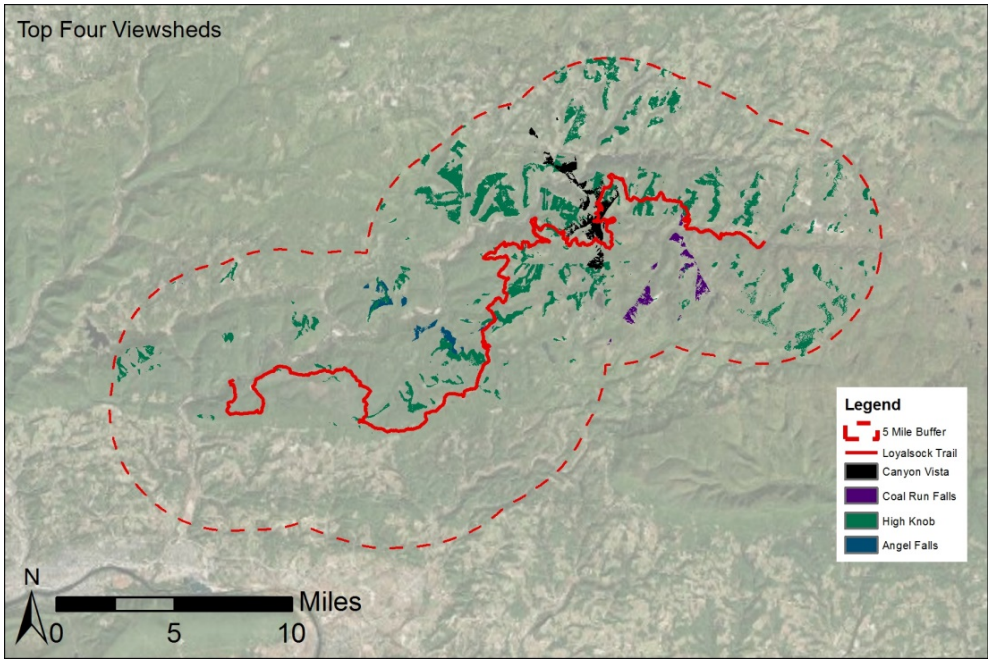

Fig. 8: Viewsheds of top four most popular locations

With so many counties and municipalities covered in this study, it is difficult to know how and where to start scenic conservation design. Crowdsourced data is a powerful means to capture broad community and constituent input. It is not totally representative of the population but neither is holding a public meeting. Collecting a wide range of views helps to delegate and prioritize conservation efforts within the region.

Using widely accepted natural and cultural amenities as a cornerstone for conservation is also a great way to bring together groups who may disagree on land use practices. In this study, both pro- and anti-Marcellus shale groups can realize the importance of the identified locations, not only within their communities but also in the greater context of the region and beyond.

In conclusion, the knowledge and opinion of the public at large are valuable resources, and with the ease and availability with which this information is able to be gathered and vetted, it is imperative that designers utilize this data in any and all public design and planning projects. The external views may not be the only indicator of aesthetic value; other metrics may be better indicators of preference, but views are a strong starting point for research. It

may also be of value to consider areas which may not have been photographed and uploaded to the online repository. Crowdsourced data as a design tool has proved to have many uses. In this study, crowdsourced data was used to identify and prioritize cultural and natural amenities for scenic conservation. In the Marcellus shale and other regions these methods could be applied to the protection of amenity value along scenic byways and waterways, as well as other hiking trails, scenic overlooks and wilderness areas. Combined with precedent conservation ordinances, such as steep slope and ridgeline protection, crowdsourced data helps to prioritize and streamline conservation design.

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