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Embedded interactive Google Earth files are best viewed in Google Chrome or Microsoft Internet Explorer. You may need to download and install a Google Earth Plug-in for your browser. If so, you will be prompted to do so. The process is straightforward.
Works best with a high speed internet connection.
Final version of IMaGe logo created by Allen K. Philbrick from original artwork from the Founder.

IMaGe Silver Jubilee

SOLSTICE,
VOLUME XXI, NUMBER 2;
December, 2010

Front matter: December, 2010.
Editorial Board, Advice to Authors, Mission Statement
Awards

The Quest to Save Honey:
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Associated .kmz file
Sandra L. Arlinghaus and William E. Arlinghaus

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Solstice Archive

Solstice: An Electronic Journal of Geography and Mathematics,
Volume XXI, Number 1
Institute of Mathematical Geography (IMaGe).

Solstice was a Pirelli INTERNETional Award Semi-Finalist, 2001 (top 80 out of over 1000 entries worldwide)

One article in Solstice was a Pirelli INTERNETional Award Semi-Finalist, 2003 (Spatial Synthesis Sampler).

Solstice is listed in the Directory of Open Access Journals maintained by the University of Lund where it is maintained as a "searchable" journal.

Solstice is listed on the journals section of the website of the American Mathematical Society, http://www.ams.org/

Solstice is listed in *Geoscience e-Journals*

IMaGe is listed on the website of the Numerical Cartography Lab of The Ohio State University: http://ncl.sbs.ohio-state.edu/4_homes.html

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Congratulations to all *Solstice* contributors.

Remembering those who are gone now but who contributed in various ways to *Solstice* or to IMaGe projects, directly or indirectly, during the first 25 years of IMaGe:

Allen K. Philbrick | Donald F. Lach | Frank Harary | William D. Drake | H. S. M. Coxeter | Saunders Mac Lane | Chauncy D. Harris | Norton S. Ginsburg | Sylvia L. Thrupp | Arthur L. Loeb | George Kish |

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SOLSTICE: AN ELECTRONIC JOURNAL OF GEOGRAPHY AND MATHEMATICS

http://www.imagenet.org

December, 2010

VOLUME XXI, NUMBER 2

ANN ARBOR, MICHIGAN

Persistent URL: http://deepblue.lib.umich.edu/handle/2027.42/58219

WebSite: http://www.imagenet.org

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MISSION STATEMENT

The purpose of Solstice is to promote interaction between geography and mathematics. Articles in which elements of one discipline are used to shed light on the other are particularly sought. Also welcome are original contributions that are purely geographical or purely mathematical. These may be prefaced (by editor or author) with commentary suggesting directions that might lead toward the desired interactions. Individuals wishing to submit articles or other material should contact an editor, or send e-mail directly to sarhaus@umich.edu.

SOLSTICE ARCHIVES

Back issues of Solstice are available on the WebSite of the Institute of Mathematical Geography, http://www.imagenet.org and at various sites that can be found by searching under "Solstice" on the World Wide Web. Thanks to Bruce Long (Arizona State University, Department of Mathematics) for taking an early initiative in archiving Solstice using GOPHER.

PUBLICATION INFORMATION

To cite the electronic copy, note the exact time of transmission from Ann Arbor, and cite all the transmission matter as facts of publication. Any copy that does not superimpose precisely upon the original as transmitted from Ann Arbor should be presumed to be an altered, bogus copy of *Solstice*. The oriental rug, with errors, serves as the model for creating this weaving of words and graphics.

Awards and Recognition

- 2010: S. Arlinghaus invited to
  - serve as Editorial Board member for ***Geographical Analysis***
  - serve as Series Editor for CRC Press
- 2009: Best of 3D Warehouse awards (blue ribbons) in addition to those listed below--for work of Archimedes (aka S. Arlinghaus) updating UM models reflecting change in base plate of aerials made by Google in June of 2007. Current status of awards:
  - Archimedes continues as a "Featured Modeler" in the Google 3D Warehouse. She was selected among the first five when this segment was created and has been featured in it ever since.
  - Downtown adjusted models awarded Blue Ribbon status: 1 (Ann Arbor News, partial), 2 (Main and Liberty).
  - University of Michigan campus models awarded Blue Ribbon status: 1 (Angell Hall), 2 (Burton Tower), 3 (Chemistry Building), 4 (Clements Library), 5 (Crisler Arena), 6 (Dennison), 7 (East Hall), 8 (Graduate Library, Hatcher), 9 (Hill Auditorium), 10 (Michigan League), 11 (Modern Languages Building), 12 (Natural Sciences), 13 (President's House), 14 (Rackham), 15 (Randall Labs), 16 (Shapiro Undergraduate Library), 17 (Tappan), 18 (West Hall).
- 2009: Kerry Ard wins Google Earth KML Research Competition. One of two top awards in the student category. The only US student to win.
- 2009: *Solstice* covers displayed in 'Journal Covers" exhibition at the Science Library of The University of Michigan.
- 2008: S. Arlinghaus invited to speak at Google 3D Warehouse Base Camp in Mountain View, CA at the GooglePlex. Had to decline the invitation; nonetheless, was nice to be thought of as representing higher education in regard to work already done.
- 2008: Best of 3D Warehouse awards number over 50.
- 2007: Best of 3D Warehouse awards (blue ribbons); these buildings come up default in all free downloads of Google Earth when the "3d buildings" checkbox is checked. They are designed for planning, rather than for architectural, purposes; file size is kept small. What is important is giving the "impression" of the building rather than giving large amounts of detail. View the associated .kmz files in Google Earth to understand the context; they are attached to the linked pages below. Be sure to turn on the "terrain" switch, otherwise buildings made in older software (older versions of Google SketchUp) will float above the surface.
  - Archimedes's models (S. Arlinghaus is "Archimedes").
    - Campus models of Arlinghaus: 1 (Alumni Center), 2 (Angell Hall), 3 (Angell Hall Complex), 4 (Art Museum, first model), 5 (Art Museum, second model), 6 (Bagnoud Building), 7 (Biomedical Sciences Building), 8 (Bursley Hall), 9 (C. C. Little Building), 10 (Chemistry Building), 11 (Clements Library, first model), 12 (Clements Library, second model), 13 (Crisler Arena), 14 (Dennison Building, first model), 15 (Dennison Building, second model), 16 (East Hall, first model), 17 (East Hall, second model), 18 (Frieze Building), 19 (Hatcher Library North), 20 (Hatcher Library South), 21 (Haven Hall), 22 (Hill Auditorium, first model), 23 (Hill Auditorium, second model), 24 (Kraus Natural Science Building), 25 (Michigan League, first model), 26 (Michigan League, second model), 27 (Literature, Science, and the Arts Building), 28 (Mason Hall), 29 (Michigan Stadium), 30 (Modern Language Building), 31 (Northwood IV), 32 (Pharmacy College), 33 (Power Center), 34 (Rackham Building, first model), 35 (Rackham Building, second model), 36 (Randall Laboratory), 37 (Schembechler Hall), 38 (Shapiro Library), 39 (Tappan Hall, second model), 40 (Tisch Hall), 41 (University Hospitals), 42 (West Hall, first model), 43 (West Hall, second model).

- DDA models of Arlinghaus: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
- Build Your Campus competition models--student participants each won at least one blue ribbon, as a Best of 3D Warehouse award
  - Lauren Leigh Hoffman: Dana Building
  - Juan Sergio Ponce de Leon: Yost Arena, South Quad
  - Andrew Walton: Golf Course Clubhouse

- 2007: University of Michigan models of about 300 buildings included in the online folder resulting from the "Build Your Campus" competition.
- 2007: Archimedes selected by Google as a "Featured Modeler."
- 2006: Google 3D Warehouse, "Google Picks" then go to "Cities in Development" http://sketchup.google.com/3dwarehouse/ to see textured models of downtown Ann Arbor buildings.
- 2006: *3D Atlas of Ann Arbor, Version 2*. Google Earth Community, ranked a "Top 20 Rated Post" on Entrance page, December 8, 2006.
- 2006: *3D Atlas of Ann Arbor, Version 2*. Rated a 5 globe production (top score) in Google Earth Community, November 2006.
- 2004: Sandra L. Arlinghaus and William C. Arlinghaus, Spatial Synthesis Sampler, *Solstice*, Summer 2004. Semi-Finalist, Pirelli 2003 INTERNETional Award Competition.
- 2004: Sandra Lach Arlinghaus, recipient, The Presidentâ€™s Volunteer Service Award, March 11, 2004.
- 2003: Jeffrey A. Nystuen, won the 2003 Medwin Prize in Acoustical Oceanography given by the Acoustical Society of America. The citation was "for the innovative use of sound to measure rainfall rate and type at sea". It is awarded to a young/mid-career scientist whose work demonstrates the effective use of sound in the discovery and understanding of physical and biological parameters and processes in the sea.
- 2002: Sandra L. Arlinghaus, William C. Arlinghaus, and Frank Harary. *Graph Theory and Geography: an Interactive View (eBook)*, published by John Wiley and Sons, New York, April 2002. Finished as a Finalist in the 2002 Pirelli INTERNETional Award Competition (in the top 20 of over 1200 entries worldwide).
- 2001: *Solstice*, Semi-Finalist, Pirelli 2001 INTERNETional Award Competition in the Environmental Publishing category.
- 1992: *Solstice*, article about it by Ivars Peterson in *Science News*, 25 January, 1992..
- 1991: *Solstice*, article about it by Joe Palca, *Science* (AAAS), 29 November, 1991.

Patterns, Maps, and Fractals: The Case of United Kingdom Historical Data Sets

Sandra L. Arlinghaus* and Michael Batty**

INTRODUCTION

The historical data sets we work with cover a range of UK towns and cities from 1901 to 2001. To make consistent comparisons from one time to another, this study includes only those place names for which data appears in all decade sampling years. There are 458 such place names, each with a decade sampling value representing total population. When these sets are put into a spreadsheet and sorted by year, the ranking that occurs is naturally valid only for the year chosen for the ordering. Figure 1a shows a sample of the data set. In it, the ordering of the decade sets as a whole follows the 2001 data set. Thus, in 2001, Birmingham is the largest single urban entity with a total population of 960628. In previous decades, Birmingham often has a larger population than it does in 2001; however, that population figure does not necessarily place it in first rank. In 1951, for example, Birmingham had a population of 1160062 whereas Glasgow had a greater population at 1174552. Indeed, prior to 1951 (inclusive) Glasgow's population was consistently larger than that of Birmingham. By 1961 and later, the reverse is true. Evidently, detailed, consistent, and fully accurate comparisons as to ranking are not possible between successive or separated decade values. Earlier, we had mapped the datasets [Arlinghaus and Batty, 2006]. First, for 1901 for the whole set of locations for that year (Figure 1b) and then for London only across all decades (Figure 1c). A quick summary of these maps is displayed in Figures 1b and 1c in embedded .kmz files with some user control. Run your mouse over the image; navigation tools appear on the right side. Zoom in; move around; tilt the image, using the scroll wheel, to see the three dimensional bar charts reflecting total population at each location. Readers wishing the full experience should follow the link to the original article in the references [Arlinghaus and Batty, 2006], download the full .kmz files, and launch them in Google Earth in order to control layer appearance. Evidently it is possible to get a good picture of pattern based on these data sets and then to see where pattern might lead as a guide to further analysis--either numerical or historical. In this paper we extend the mapping analysis done earlier to cover broader issues, such as rank changes and space-filling, using the full set of data.

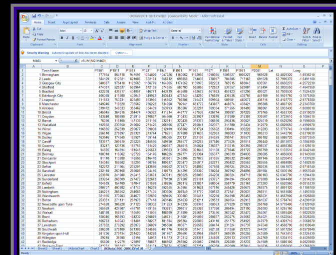

Figure 1a. A sample of UK historical urban data sets, ordered from high to low on the column for 2001 total population data.

1901 Data

Figure 1b. 1901 data portrayed in Google Earth.

Greater London Data

Figure 1c. London data, 1901 to 2001, portrayed in Google Earth.

MAPPING THE ENTIRE DATA SET

Mapping the data sets, using latitude and longitude values calculated from a GIS database, reveals a variety of ranking issues. The size and number of the categories (ranges) that arise alters the outcome of associated mapped pattern. In Figure 2, the 458 values in each of 10 decades fall into 10 ranges of equal size: each range contains 45 or 46 entries per year. The same "large" circular symbol, for example, serves to represent the 45 largest cities of 1901. Similarly, that same size circle represents the 45 largest cities of 1911 (not necessarily the same ones as in 1901), and so forth. The graduated circular symbols reflect variation in data set size. The color alternates between red and white, by decade. Thus as time progresses, concentric circles of alternating color reflect accumulated decrease in population. Glasgow City reflects this characteristic. What gets hidden is red circles from a later decade in relation to red circles from a much earlier decade (for example). The mapped pattern of Glasgow in Figure 2, however, adds an extra dimension to the data set in the table of Figure 1a. Animation of the maps lets us pinpoint some locations that change range from one decade value to the next.

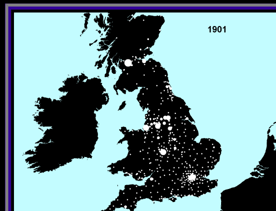

Figure 2. Data sets of Figure 1a mapped using 10 equal intervals of 45 or 46 to separate the 458 entries into classes represented by varying circle size. Circle colors alternate from white to red by decade. Thus, the emphasis is on tracking decline from one decade value to the next.

Further GIS work may offer different or additional insight into mapping the data. For example, altering the method of ranging the data causes new pattern to appear. Figure 3 shows the results of mapping the same data using standard deviations to separate the data sets rather than using equal intervals. Data are assigned large or small circles according to whether they are one, two, or more standard deviations above or below the mean of a particular year. Thus, there may be more or fewer than 45 observations in a single range. A number of interesting patterns in Figures 2 and 3 offer promising directions for further investigation. As in some of our previous efforts involving these data sets, as suggested in Figures 1b and 1c, viewing the whole, and a part, are an attractive alternative.

Figure 3. Data sets from Figure 1a mapped ranging the data by standard deviations. Smallest circles represent values farthest below the decade-value mean; largest circles represent values farthest above the decade-value mean.

MAPPING THE DATA AS REGIONAL SETS IN TIME AND SPACE

Glasgow, Scotland

Glasgow, Scotland, stands out in both Figures 2 and 3 as a place of considerable population change over time. Figure 4 shows the 1961 data mapped with the 1971 data superimposed and also with the 1991 data superimposed. What one also sees clearly from the mapped data sets, that is not evident in looking at only the numbers, is the general context in which such change is happening. As the ranking of Glasgow changes, what is happening to its neighbors? Indeed, is the observed shrinkage of the central city simply an expression of loss, or is it an indication of boundary change? Careful observation of mapped evidence can help to guide research. In this case, there is in fact an issue of boundary change, in addition to other factors, associated with the mapped pattern (Wikipedia).

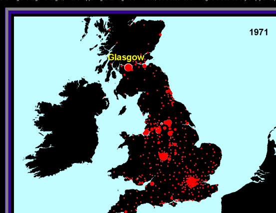

Figure 4. Focus on Glasgow, Scotland. Notice the decline in city circle size as time progresses.

Greater London Area, England

In Figures 2 and 3 it is difficult to see the pattern in the London area; however, there are hints of color show-through from one decade to the next. In Figure 5, we see the results of taking a closer look at changes in the greater London area, with maps based on the equal interval ranging method. Figure 5a shows London of 1931 with London of 1941 superimposed where one sees a decline in central area population from 1931 to 1941. Reversing the overlay of these two layers within the GIS shows additionally, in Figure 5b, the growth of some surrounding towns in 1941. Apparently the population shifted outward. This same pattern continues in looking at the pair 1941, 1951 (again flip-flopping the layers) in Figures 6a and 6b. Continuing the process until the most recent data from 2001 continues the pattern: Figures 7a and 7b, 1951/1961; Figures 8a and 8b, 1961/1971; Figures 9a and 9b, 1971/1981; Figures 10a and 10b, 1981/1991; and Figures 11a and 11b, 1991/2001. In the later years, note that there is a hint of stabilization, and possible trend toward repopulation, of the center. Modern technology permits the easy presentation of a wealth of mapped evidence at no additional publication cost. Sprawl of London outward from its center is clearly evident in the mapped data of the late 20th century.

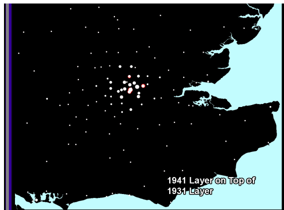

Figure 5a. Some central cities within the conurbation are larger in 1931 (red) than in 1941 (white). Does decline at the center result from movement of population outward (or elsewhere) or from larger than usual number of deaths (due to war)?

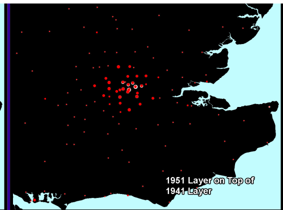

Figure 6a. As in Figure 5a, decline at the center. Some values from 1941 (white) are larger than corresponding ones from 1951 (red).

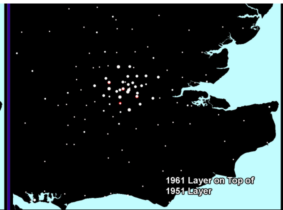

Figure 7a. Shrinkage of towns near the center. Some 1951 (red) towns are larger than their corresponding 1961 (white) counterparts.

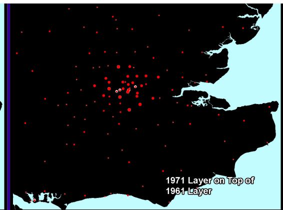

Figure 8a. Shrinkage of towns near the center. Some 1961 (white) towns are larger than their corresponding 1971 (red) counterparts.

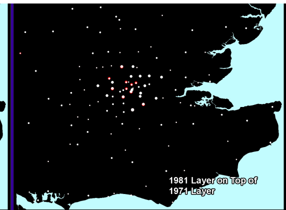

Figure 9a. Shrinkage of towns near the center. Some 1971 (red) towns are larger than their corresponding 1981 (white) counterparts.

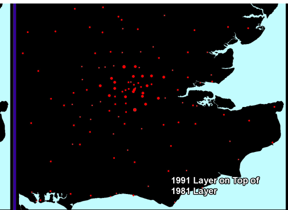

Figure 10a. Shrinkage at the center is no longer evident. All 1991 (red) towns appear to be at least as large as their corresponding 1981 (white) counterparts.

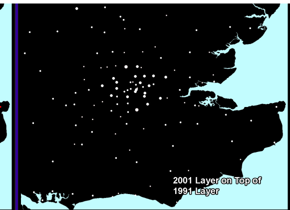

Figure 11a. Shrinkage at the center is no longer evident. All 2001 (white) towns appear to be at least as large as their corresponding 1991 (red) counterparts.

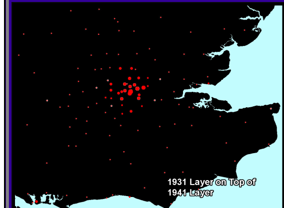

Figure 5b. Some edge-cities within the conurbation are larger in 1941 than in 1931. Coupled with Figure 5a, this pattern might represent the beginning of sprawl.

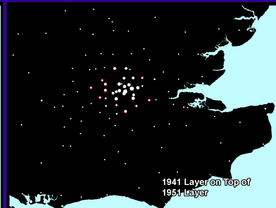

Figure 6b. As in Figure 5b, growth of towns away from the center. Some 1951 towns (red) are larger than 1941 (white) towns. More evidence of outward movement.

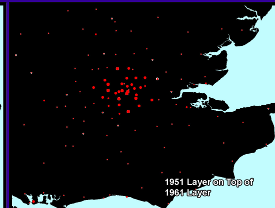

Figure 7b. More enlargement of towns near the periphery. Some 1961 towns (white) are larger than their corresponding 1951 (red) counterparts.

Figure 8b. More enlargement of towns near the periphery. Some 1971 towns (red) are larger than their corresponding 1961 (white) counterparts.

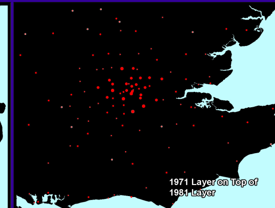

Figure 9b. More enlargement of towns near the periphery. Some 1981 towns (white) are larger than their corresponding 1971 (red) counterparts.

Figure 10b. More enlargement of towns near the periphery. Some 1991 towns (red) are larger than their corresponding 1981 (white) counterparts.

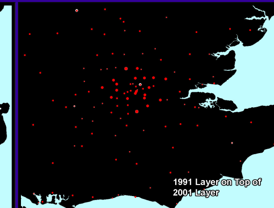

Figure 11b. More enlargement of towns near the periphery. Some 2001 towns (white) are larger than their corresponding 1991 (red) counterparts. Notice one town near the center that is growing in 2001. Does this observation, coupled with Figures 10a and 11a, suggest a reversal of trend? Are people moving back to the central areas?

The sequence of maps in Figures 5a to 11b offers clear visual evidence of sprawl and it does so in a spatial context that permits seeing expansion of pattern to fill space. To capture, numerically, the space filling character of the sprawl, it is useful to apply concepts from fractal geometry to the distribution of dots. The software, Fractalyse, is applied to black and white .tif images of the distribution of dots. Space-filling is measured by counting numbers of black pixels in a sampling window whose scale is varied (to simulate fractal iteration sequences). The box method was used with a non-linear estimating curve of the form $y=a*x^d+c$. Figures 12a shows the set of maps to which the software was applied. These maps show the dot distribution with ranging according to the standard deviation strategy; the ranging method chosen alters the outcome of the dimension measure because the number of black pixels varies with the ranging method. Figure 12b shows the results of applying the software and the adjusted correlation coefficient indicating goodness of fit of the experimental curve derived in the box method with an estimating curve derived from the selected equation. Figure 12c graphs the results.

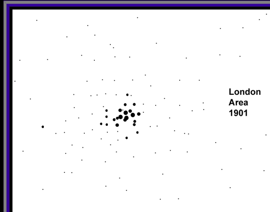

Figure 12a. London area towns; mapped ranges based on standard deviation partitions. Maps are prepared in true black and white .tif format suitable for use in the free Fractalyse software.

Date	Dimension	Adjusted Correlation Coefficient
1901	1.588	0.996908
1911	1.567	0.996903
1921	1.577	0.997150
1931	1.575	0.997202
1941	1.582	0.997518
1951	1.556	0.997143
1961	1.550	0.997337
1971	1.617	0.998897
1981	1.623	0.998954
1991	1.631	0.999059
2001	1.636	0.999096

Figure 12b. Fractal dimensions of the frames of the animated image in Figure 12a, derived using the "box counting method."

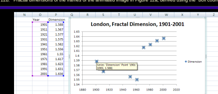

Figure 12c. Graph of data in Figure 12b. Once again, from yet another vantage point, the decade between 1961 and 1971 is one of great change. Observe, as well, the low values in the World War II decades following earlier stability. The animation is similar in nature to one in an earlier article [Arlinghaus, Batty, and Nystuen, 2003].

CONCLUSION

From tables of data, to animated color map sequences, to regional maps with shifted layers, to mapped views of sprawl, and back to numerical tables based on fractal dimensions capturing mapped sprawl, all paint the same picture of greater London. Before World War II, things are fairly steady. After the war, there is much change. By 1971, the center is clearly depopulating, people are moving out farther from the center as time progresses, and sprawl is fully entrenched and possibly reversing itself by the 2000s. Some methods show spatial context and are helpful for visualizing what else is happening nearby. Others show the picture numerically and make further arithmetical analysis easy. The fractal approach, using this software, appears a promising one. No strategy is complete; however, they work well together to offer various slants on a complex data set!

References and Software:

- Adobe, PhotoShop and ImageReady.
- Arlinghaus, Sandra L. and Batty, Michael. 2006. Visualizing Rank and Size of Cities and Towns. Part I: England, Scotland, and Wales, 1901-2001. Part II: Greater London, 1901-2001. *Solstice: An Electronic Journal of Geography and Mathematics.* Volume XVII, Number 2. Ann Arbor, Institute of Mathematical Geography.
- **Arlinghaus, Sandra L.; Batty, Michael; and, Nystuen, John D. with input from Naru Shiode. 2003. Animated Time Lines: Coordination of Spatial and Temporal Information.** *Solstice: An Electronic Journal of Geography and Mathematics.* Volume XIV, Number 1. Ann Arbor, Institute of Mathematical Geography. Direct link
- ESRI, GIS software. ArcView 3.2; ArcMap9.1.
- Fractalyse http://www.fractalyse.org/en-home.html
- Microsoft Excel, 2007.
- Wikipedia, Glasgow. http://en.wikipedia.org/wiki/Glasgow

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The primary author wishes to thank Professor Daniel A. Griffith, Ashbel Smith Professor of Geospatial Information Sciences; University of Texas at Dallas; School of Economic, Political and Policy Sciences; 800 W. Campbell Road; Richardson, TX 75080-3021; dagriffith@utdallas.edu, for pointing her to the Fractalyse software site.

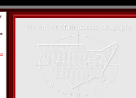

IMaGe logo designed by Allen K. Philbrick from an original provided by the Founder.

Mapping It Out!
A Contemporary View of Burgess's Concentric Ring Model of Urban Growth

Sandra L. Arlinghaus* and Daniel A. Griffith**

Download the associated .kmz file to open in Google Earth

Our recent collaboration involving research on non-Euclidean fractals leads in a variety of directions, both "real" and "virtual." In one case, we consider the expansion of urban growth pattern and analyze that expansion using fractal measures of the non-Euclidean Manhattan geometry. One particular case, illustrating that urban application, employs the simple Burgess concentric ring model. That model, originally cast in Chicago of the mid 1920s, sees a spread of population density outward from the center. Figure 1 shows a characterization from those times (Park and Burgess, 1925). While the ideas are straightforward to grasp, there is little indication in the schematic of where the model is anchored in terms of the real world. The zone names give only general hints. Phrases such as "Second Immigrant Settlement" are of little assistance. The lead author grew up in Chicago, in the Hyde Park area on the south side (the University of Chicago neighborhood), and remembers the so-called "Black Belt" as centered on the north/south street called South Parkway (renamed later as Martin Luther King Drive), a bit to the west of Cottage Grove, the western boundary of Hyde Park. Memories such as that are helpful but are not solid benchmarking evidence for this historical map. Such benchmarking is important because without it, much historical material may become lost in the gap between paper and digital files.

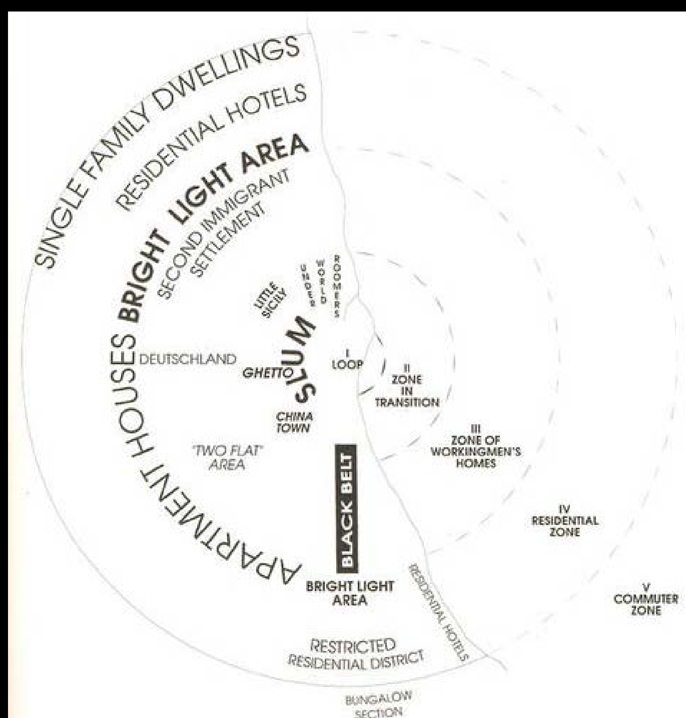

Figure 1. Burgess Concentric Ring model of Chicago population patterns in the 1920s (Park and Burgess, 1925, p. 55).

Contemporary technology permits the easy mapping of all streets in Chicago simply by downloading Tiger files from the U.S. Bureau of the Census and opening them in GIS software (from ESRI, for example). The map in Figure 2 shows the contemporary street pattern with Burgess rings inserted in appropriate positions. A smaller version of this map is to appear in a conventional print journal. In the associated article, we describe in text how to move from the historical map of Figure 1 to the contemporary map of Figure 2. Mere description, however, falls far short of offering clear strategy for using fundamental spatial concepts to move across the digital divide. Figures 3 and 4 below show the story of how cross that divide and to get from there

(Figure 1) to here (Figure 2).

Figure 2. Contemporary Tiger files of the Chicago street network overlain with Burgess concentric rings positioned as suggested in Figure 1.

A search of the internet turned up a map of Chicago's Ganglands, from the 1920s, that identified "bright lights" areas on it in association with streets that exist today (Thrasher, 1923-1926). The Bright Lights area on the south side of Chicago is clearly marked along 63rd Street, west of Cottage Grove. This independent evidence from the times, using identical jargon, was the key to making an alignment of the Burgess model with actual maps as the Burgess model also mentions a "Bright Lights" area on the south (and north) side. The animation in Figure 3 shows a sequence of overlays: the scanned portion of the Gangland map that covers Hyde Park and west serves as an overlay on the Google Earth globe. It is aligned with Midway Plaisance (present on map and globe) and the scale of the imported image is adjusted to force street patterns, common to map and globe, to fit each other. The fit is reasonable at a general view but is clearly far from a perfect fit. There is no information on the map itself as to projection. To take a closer look at the fit, Tiger files mapped in GIS software and exported from it to .kml format, are opened in Google Earth. These files align with the roads in Google Earth and offer an opportunity to view 3D buildings and street scenes of today, captured in Google Earth, in association with that imported fine-mesh road network. How nice it would be to imagine, as well, similar street scenes of yesteryear available within the software so that the Chicago of Burgess might come to life on the screen, as well. Two independent contemporary sources fit each other. Confidence in position of roads is secure. The subsequent frames of the animation show the Bright Lights area along 63rd Street marked in the Gangland Map aligned with the

Bright Light Area of the Burgess model of Figure 1. The Black Belt area lies along South Parkway (Martin Luther King Drive) and one has confidence that the fit is reasonable; the model itself is very general so that one probably cannot expect ever to have a really accurate fit (as there is between Tiger and Google Earth files). Because infill of Lake Michigan, to create new lands, has been a persistent strategy to enhance Chicago's spectacular lakefront, looking for coastal alignment over a time period of more than three quarters of a century is not as effective a strategy as is looking for street alignments. That situation is contrary to many mapping alignment strategies that see hydro networks as more permanent than road networks. Knowledge of particular planning or cultural practice can be critical in making good benchmarking decisions.

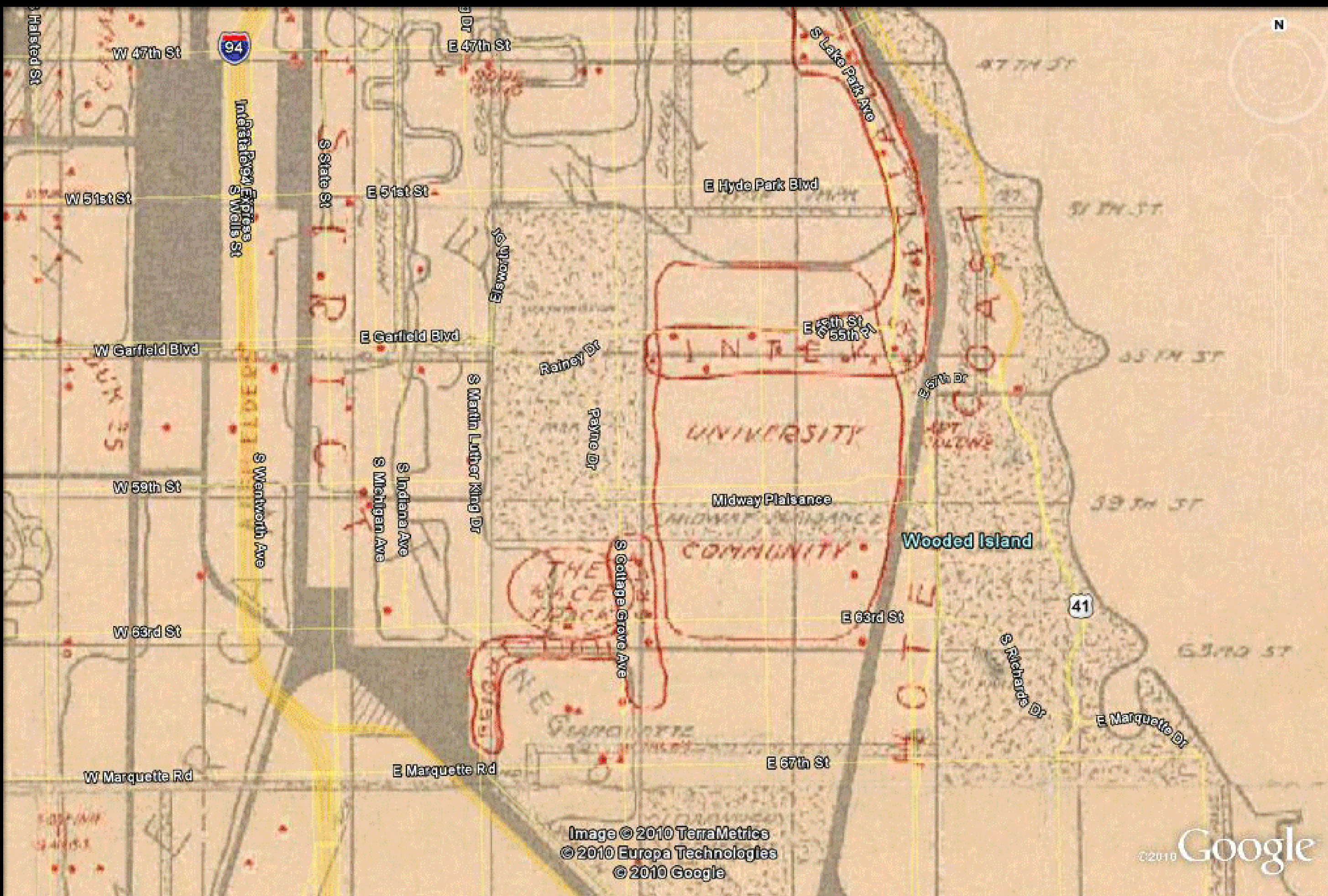

Figure 3. Alignment of a Gangland map of the 1920s with Tiger files of today and the Burgess model of Figure 1, all superimposed as layers in Google Earth which permits the easy stretching of scanned images to fit the underlying Google Earth globe.

Once one neighborhood fits, it is straightforward to repeat the process for more segments of the Gangland map. This process is similar conceptually to using gores to fit a flat map onto a spherical globe. When a good fit is known not to be present, as in this case, split the map into smaller pieces and align them with each other and with the base surface. Smaller pieces produce smaller alignment errors than would larger ones. The map is wrinkled at the alignment seams (that is, there is a bit of extra distortion along the seams). Thus, one has choices to consider in cutting the map apart. Figure 4 shows the set of pieces used to create the entire Gangland map against which the full Burgess model is aligned, using primarily the Bright Lights areas, south and north, noted in both historical maps.

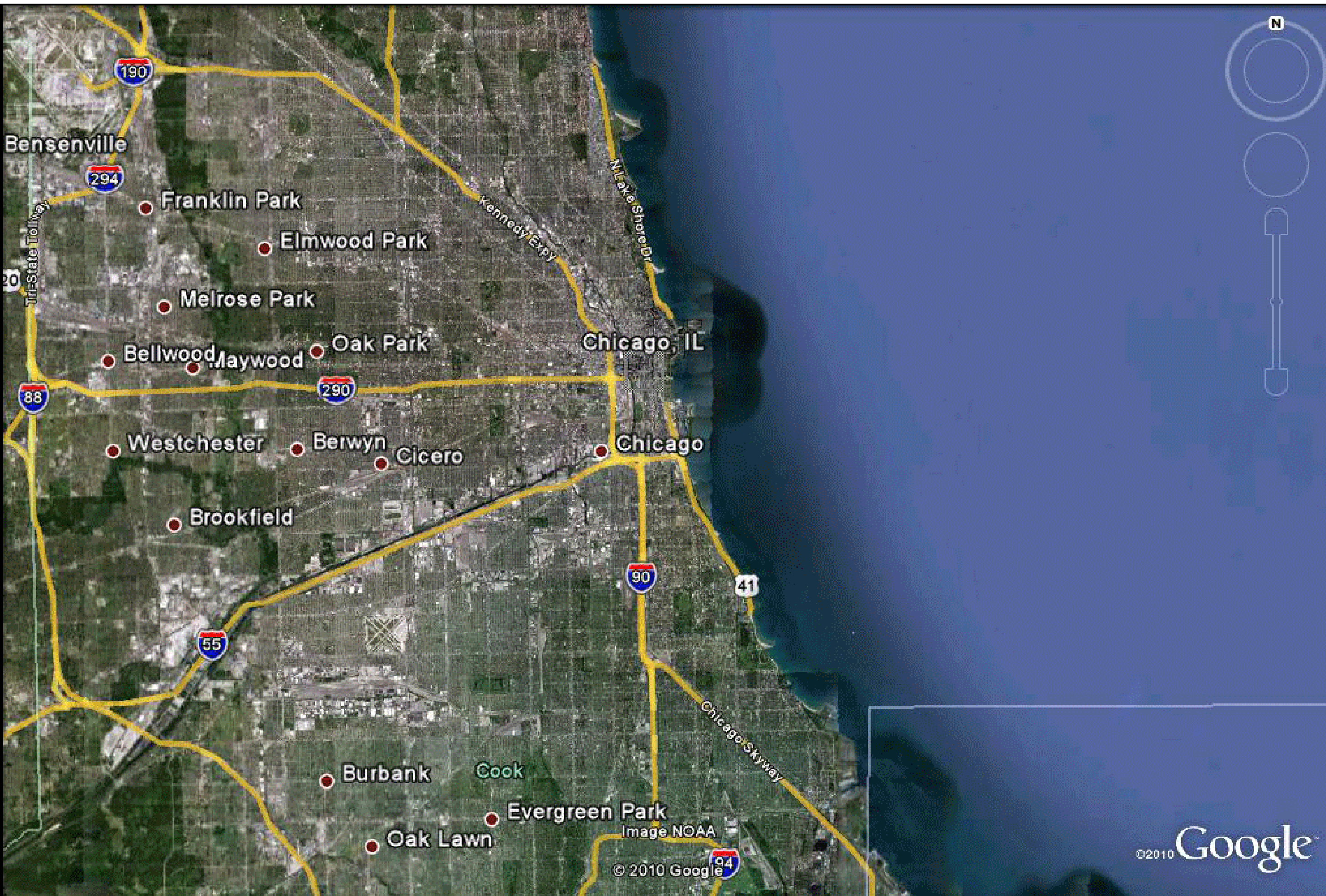

Figure 4. Insertion of flat Gangland map in Google Earth, aligned to underlying features, using the concept of "gores" or small sections reducing error in fit.

Once the Gangland map fits the Google Earth globe, it becomes easy also to align the entire Burgess model. Figure 5 illustrates that alignment, first with an image using the full rings set to semi-opaque to facilitate alignment, and then with the less cluttered half-ring maps aligned to the full ring version. From there, it is a simple matter to create corresponding rings in the GIS software, shade the underlying Tiger file road network according to ring position, and produce the Map in Figure 2.

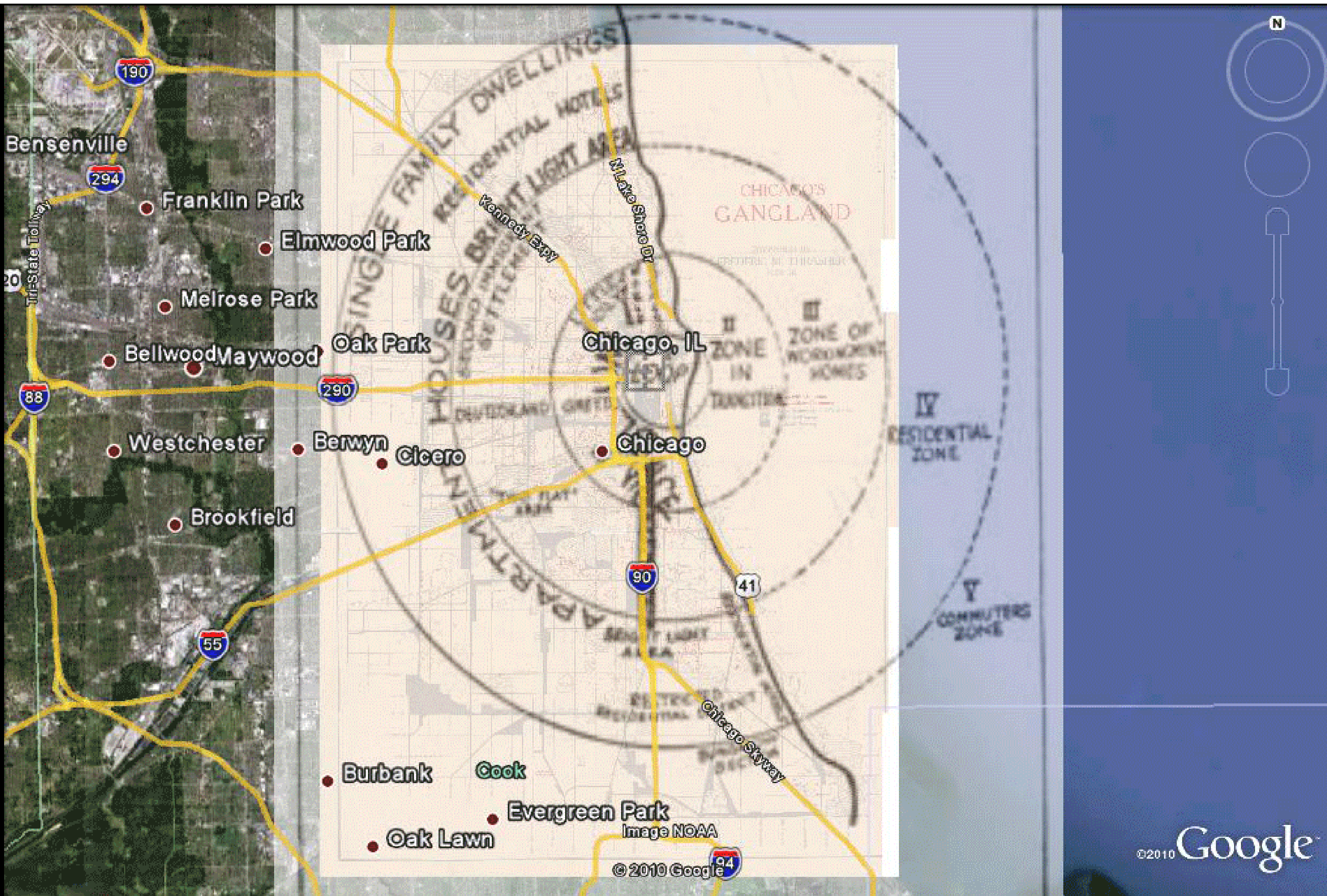

Figure 5. Alignment of the Burgess model with the Gangland map and therefore with Google Earth and associated Tiger files.

Figure 6 shows an interactive Google Earth model in which the reader may choose to zoom in and take a closer look at alignment procedures. Alternatively, for full visibility, download the file from the link at the beginning of this article and load it directly into Google Earth.

[Burgess Model, Gangland Map, TIGER file]

Gadgets powered by Google

Figure 6.   Interactive display subject to partial reader control.

Contemporary technology, coupled with enduring concepts such as benchmarking, scale shift, and error reduction, made the action of mapping straightforward although perhaps a bit tedious with many steps. What was critical was finding a map of the times [Thrasher] that showed actual location, in relation to streets, of regions noted on the Burgess model. Once again the importance of good archiving of materials [University of Chicago Libraries], and their ready availability for research purposes online, is underscored.

References and Software:

- Adobe, PhotoShop and ImageReady.
- ESRI, ArcView3.2 and ArcGIS 9.1.
- Google Earth.
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***Solstice: An Electronic Journal of Geography and Mathematics*,**
Volume XXI, Number 2
Institute of Mathematical Geography (IMaGe).

http://www.imagenet.org
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Remembering those who are gone now but who contributed in various ways to *Solstice* or to IMaGe projects, directly or indirectly, during the first 25 years of IMaGe:

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The Quest to Save Honey:
Tracking Bee Pests Using Mobile Technology

Diana Sammataro* and Sandra L. Arlinghaus**

Download the associated .kmz files to open in Google Earth: VarroaGlobal, Hawaii, Kenya
Use a high-speed internet connection.

Varroa (Acari: Varroidae) is a parasitic mite that threatens the extinction of the world's honey bee (*Apis mellifera*) population. This mite not only feeds on bees and bee larvae, but carries viral diseases and promotes stress to these hard-working insects (Sammataro et al., 2000). We have been mapping the spread of this blight for quite awhile (Figure 1) focusing on the importance of animation as a tool to draw together space and time. Understanding spatial pattern helps to tighten focus on intervention. There are obvious consequences associated with the possible extinction of honey bees: honey has long been an important agricultural crop (Ellis and Munn, 2005; Matheson, 1996). In addition, honey bees are important pollinators of one third of our crops, including fruits and vegetables and used in seed production (Free 1993; McGregor, 1976; http://www.sciencedaily.com/releases/2007/05/070510114621.htm). There are substantial economic implications to the possible demise of bee pollinators as well as to the production of honey, long used as a natural sweetener (a healthy alternative to processed sweeteners) and for medicinal purposes. The production of beeswax from the honeycomb is even more valuable, a primary foundation for cosmetics, as well as for making candles. All of these hive products have been important since beekeeping was first recorded; wax and propolis (bee-collected plant resins) were vital to preserving Egyptian mummies. Beyond the obvious, when an established species is removed from an ecosystem it is simple logic that the impact of such removal will have long-range, and perhaps unforeseen, consequences.

The Varroa problem began in Asia in the early twentieth century (Goncalves et al. 1985; Rosenkranz et al. 2010). Today, Varroa is found worldwide, with some exceptions (Bradbear 1988; Matheson 1996) such as Australia. Erroneous classification of the mite has clouded some of the reporting of information. First identified as *Varroa jacobsoni* on the Asian honey bee *Apis cerana*, molecular analysis has now separated out four different Varroa species. We refer here, for purposes of mapping, to the mite simply as "Varroa", and in general terms it represents the new *Varroa destructor* (Anderson and Trueman 2000) that jumped from the Asian honey bee onto the European honey bee (*Apis mellifera*). Careful analysis of the problem as a whole, beyond the tracking aspects, must consider the taxonomic problems as well (see Rosenkranz, et al., 2010; Navajas et al., 2010).

As late as 2000, Varroa was discovered in New Zealand (Matheson 2000), in Panama (Calderon et al. 2000) and in St. Kitts & Nevis in the Caribbean. It has also been found in the Caribbean islands of Grenada in 1994, Trinidad in 1996 (Hallim, M.K.I. 2000), Cuba in 1996, Dominica in 1998, St. Lucia in 1999, Tobago and Nevis in 2000. It apparently has also been reported in Haiti (dates forthcoming). On July 6, 2000, Varroa was first detected in Panama.

The recent discovery of Varroa mites in the Eastern Rift Valley in eastern Kenya (2009), the homeland of the honey bee species as well as a diverse population of wild (often unusual) animals, is particularly alarming because bees and honey are an integral part of subsistance-level farmers where honey is an important source of income. The discovery of mites somewhat earlier (2007) in the tropical paradise of the remote Hawaiian Islands, will have a huge impact since many breeders raise queen honey bees there. The spread of these mites can be directly attributed to the movement of bee colonies by beekeepers and as well as from some hitchhiking bee swarms on ships. Other mites are on the horizon which are equally devastating to bee pollinators.

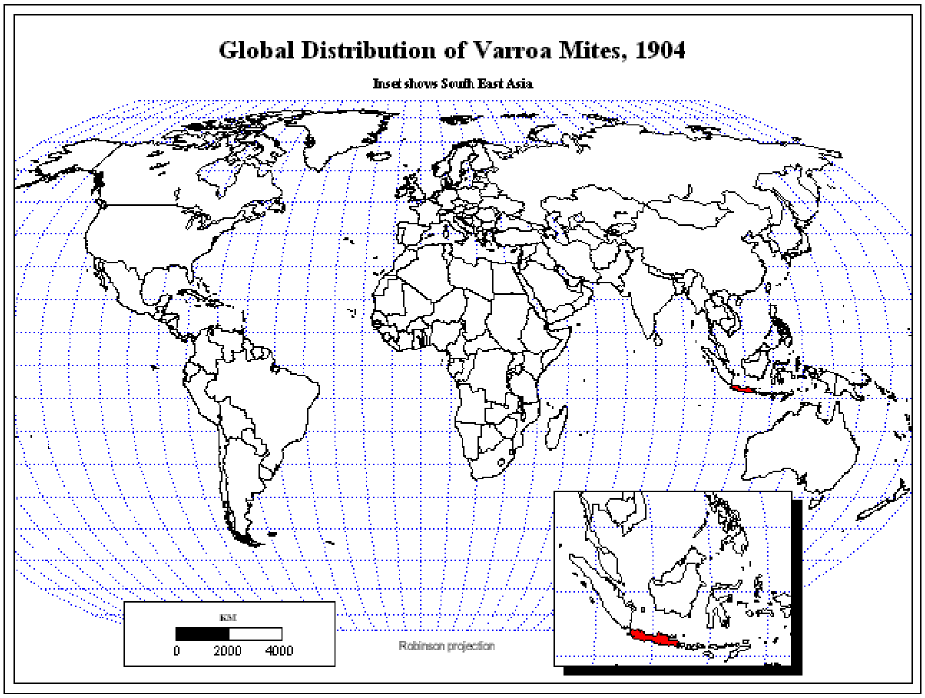

Figure 1. **Animated map.** Map by Sandra L. Arlinghaus and John D. Nystuen. *Solstice: An Electronic Journal of Geography and Mathematics*, Volume XVIII, Number 1, June 2007. http://www.imagenet.org/

Current technology permits far more than the basic mapping, by country, of Figure 1 which is really not well-suited to showing small islands. Improvement in technology to detect local locations in remote places, using GPS or other mobile technology, requires mapping capability beyond the traditional flat map. Adding local to global information about pattern yields fuller insight into spatial pattern and therefore into possible interventional strategy.

The Case of Hawaii

Detailed maps, showing sightings (or no sightings) of the mites in Hawaii can be fairly accurately superimposed in Google Earth to take advantage of layering of scientific maps, Google Earth aerials, and Google Earth Terrain. Figures 2, 3, 4, and 5 all show how to achieve such layering for each of four existing maps [Kunimoto]. The animations in these figures begin and proceed as follows through to an end product that shows superimposed Placemarks (yellow or red "balloons") representing an inventory of selected locations and whether or not varroa was present. As mapping has become more mobile, via laptops, smart phones, and GPSs, the possibility of field-checking computer results in the real world has become increasingly simplified. The mapping steps are:

- Find the general locale in Google Earth.
- Add the existing map as an image overlay (it will not be correctly aligned) (Kunimoto).
- Set the level of opacity of the added map to about 50% so that the map can be moved and stretched to fit, fairly well, the underlying landmass in Google Earth.
- While the opacity is still set at 50% add Placemarks (yellow or red balloons, in this case) at the locations (yellow dots) indicated on the maps.
- Hide the added map so that only the native Google Earth layer and the Placemarks show up.

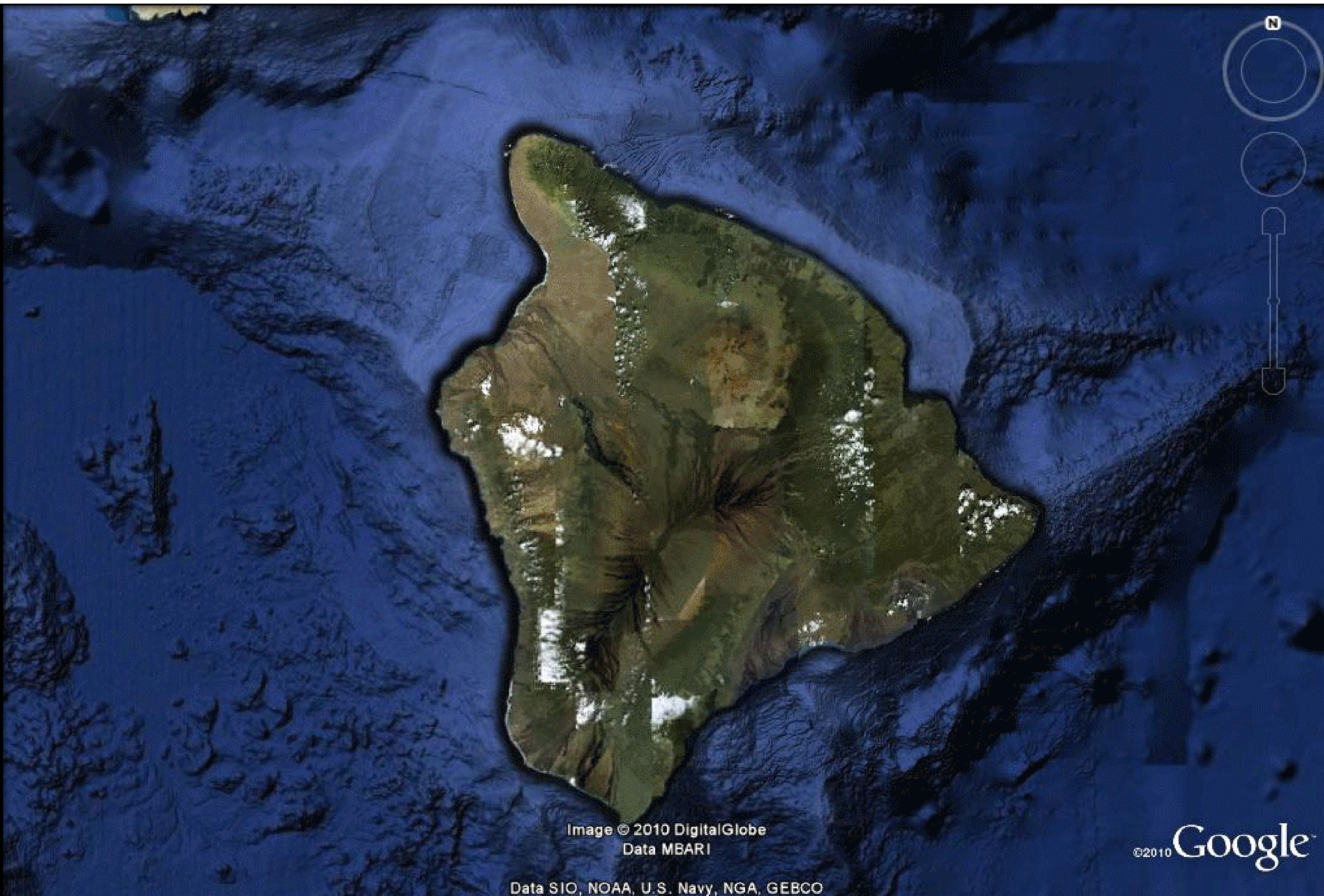

Figure 2. Hawaii (Big Island). Balloons indicate sites that are part of the mite inventory. Yellow means "no mites sighted" and red means "mites sighted."

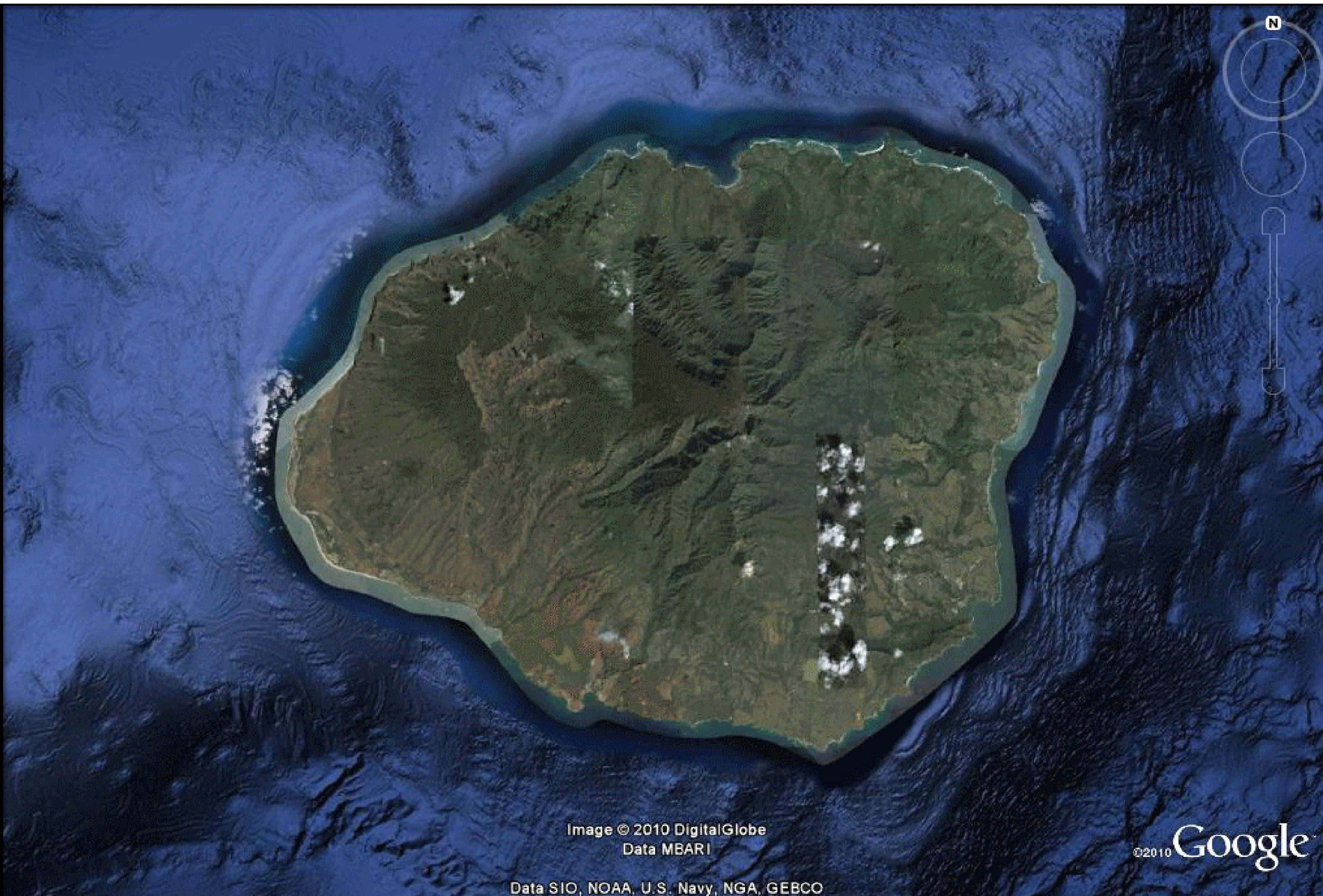

Figure 3. Kauai. Balloons indicate sites that are part of the mite inventory. Yellow means "no mites sighted" and red means "mites sighted."

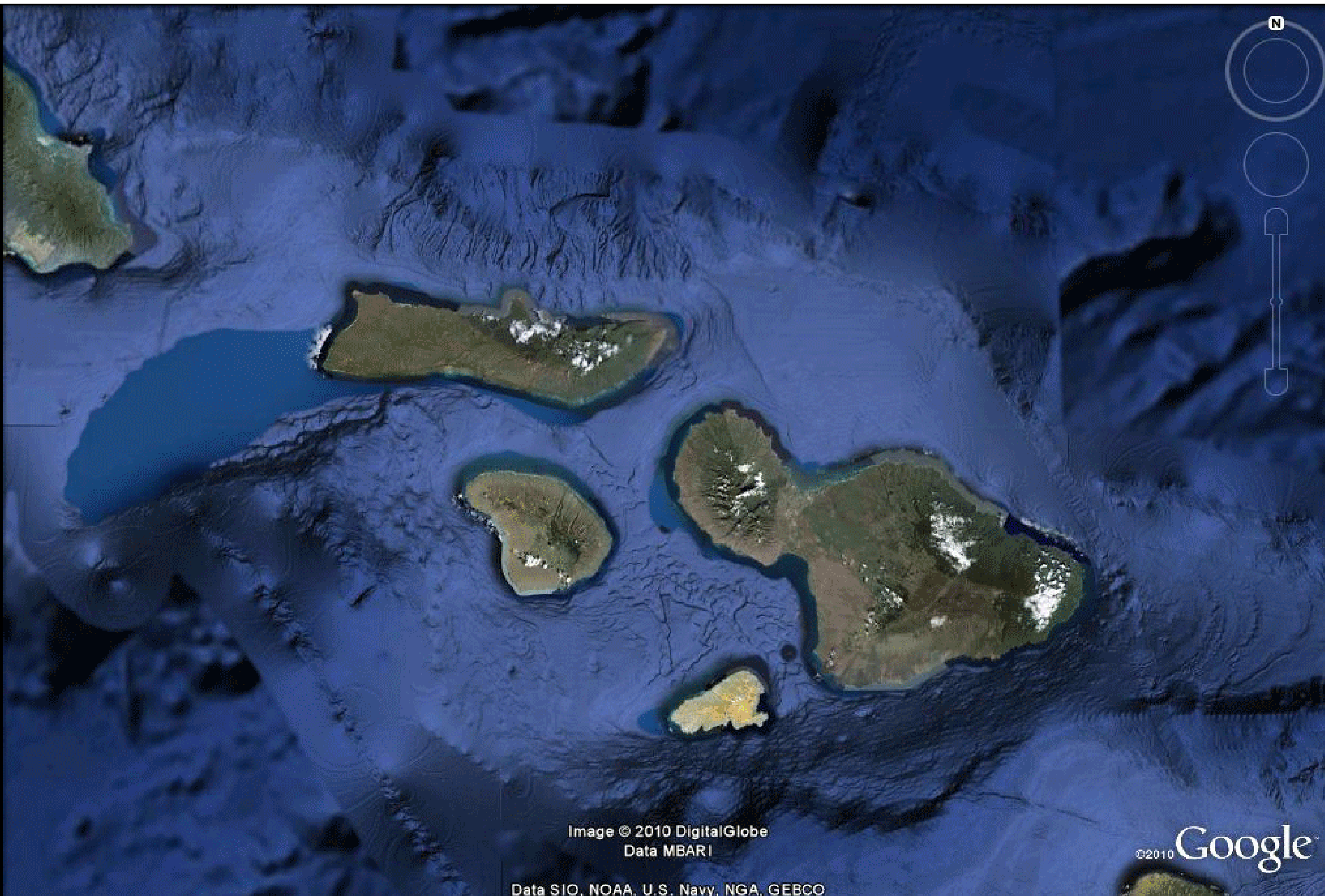

Figure 4. Maui. Balloons indicate sites that are part of the mite inventory. Yellow means "no mites sighted" and red means "mites sighted."

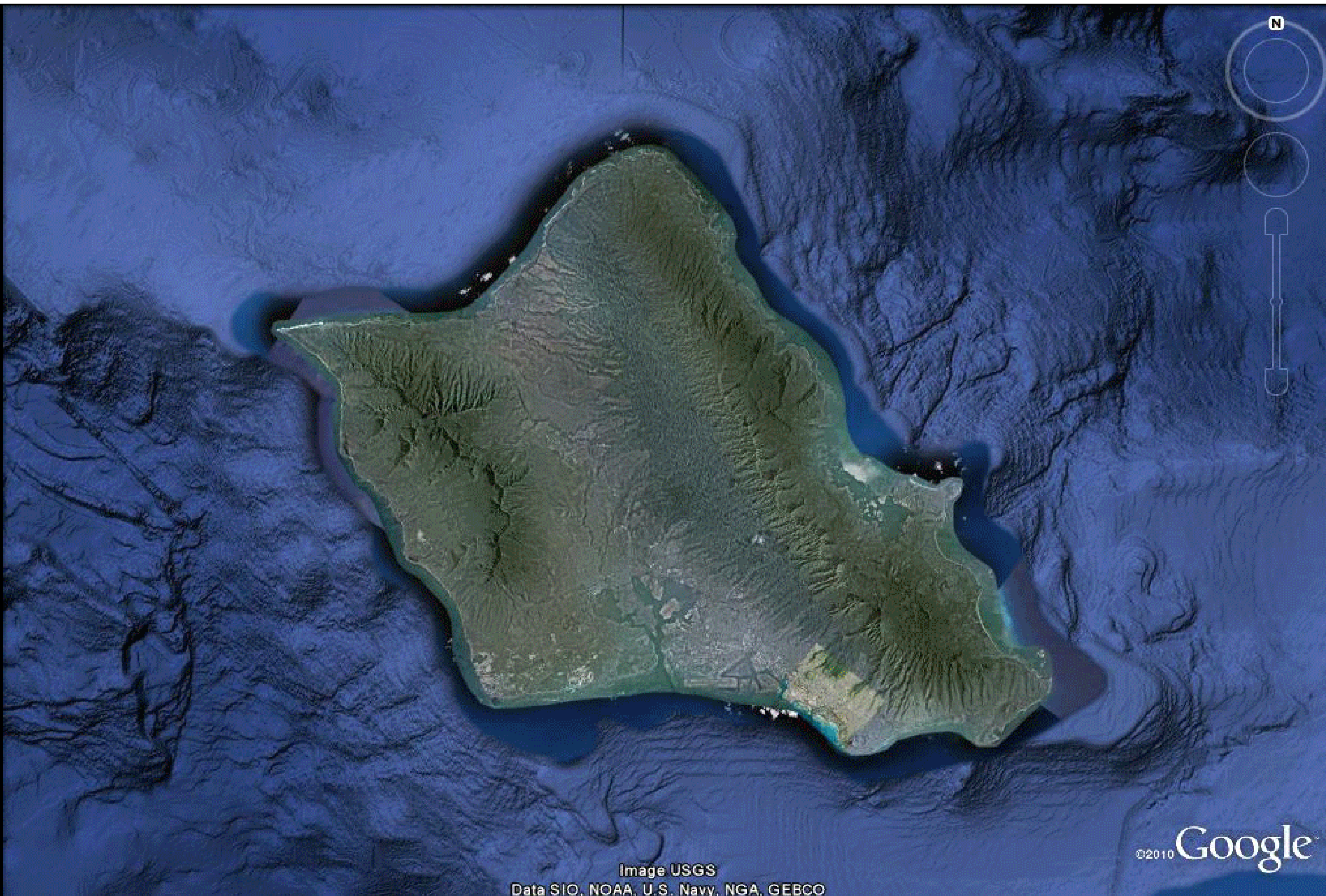

Figure 5. Oahu. Balloons indicate sites that are part of the mite inventory. Yellow means "no mites sighted" and red means "mites sighted."

Once the locations are tied to the Google Earth base, then one can zoom in and take a closer look, add other layers already present in Google Earth, and generally take full advantage of the software capability (download the Hawaii .kmz file and open it in Google Earth to look around). Such enhanced 3D visualization permits one to see the broad context of an actual environment. The major difficulty with taking a very close look, in the case of the Hawaii data, is imperfect alignment of sightings, recorded on beautiful flat maps, with the Google Earth coordinate system. The circles on the added maps really only suggest rough location and do not pinpoint location using latitude and longitude. Further, there are small misalignments because flat maps are stretched over the Google Globe (these are most evident in Figure 3, where the map is stretched in an attempt to fit a number of islands). Employing GPS technology solves both problems.

The Case of Kenya

In Kenya, the results of inventorying selected sites were recorded using GPS coordinates (Figure 6). Thus, the precision in locating them in Google Earth is greater than the precision used with the Hawaii data. However, the images available in Google Earth, and related features, while helpful, are not as rich as those available for Hawaii.

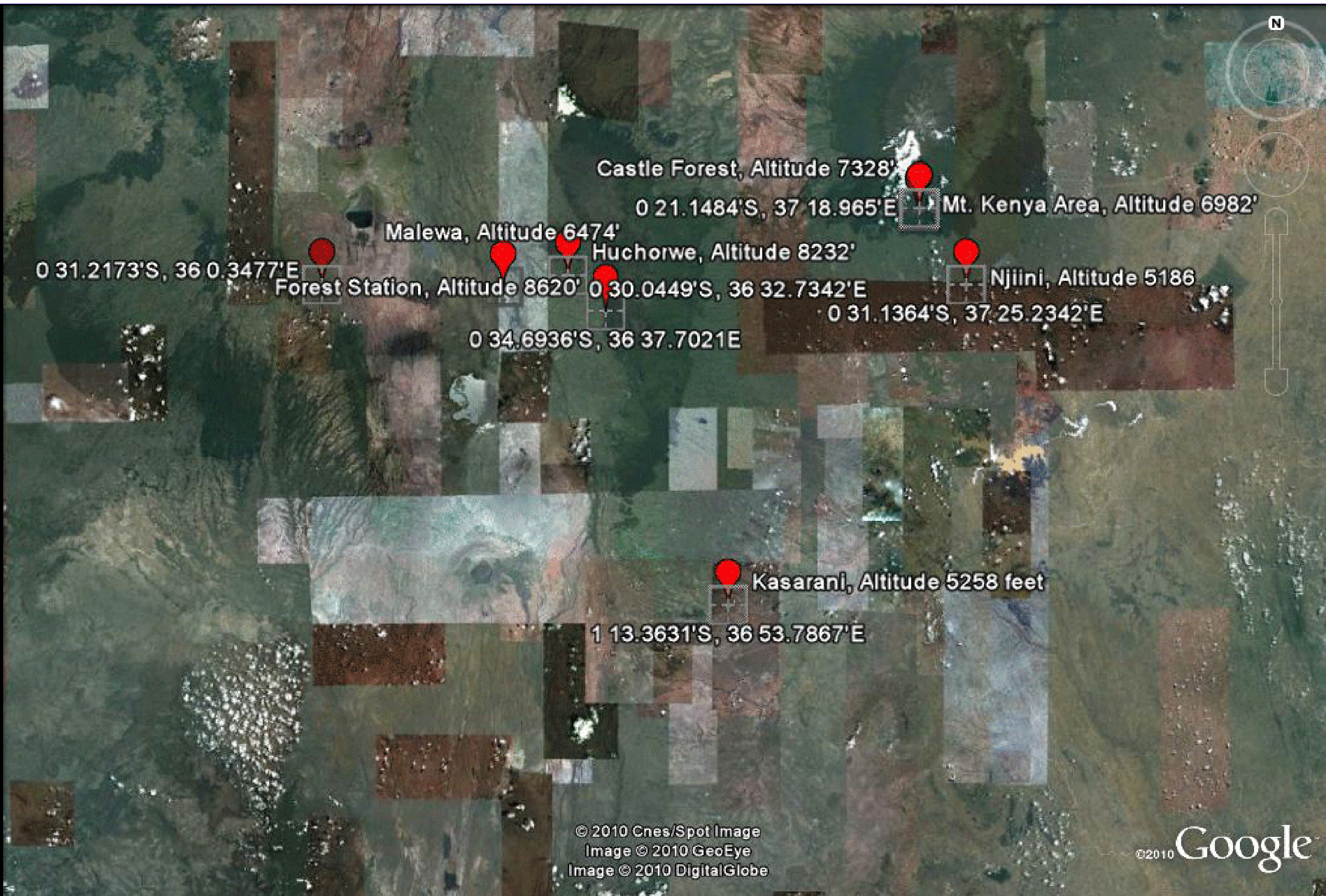

Figure 6. Locations in eastern Kenya, from GPS data.

The available imagery, whatever it might be, is nontheless vastly superior to what one might have found only a few years ago: it is in color and it is easily available and free. It is most useful, however, when other switches for other data already present in Google Earth are used to supplement it. Figure 7 shows the UNEP inventory with a sample from the Mount Kenya area of resolution higher than that of the native imagery, coupled with roads and a page from Wikipedia. Readers wishing to get the full effect should download the Kenya.kmz file and view it in Google Earth.

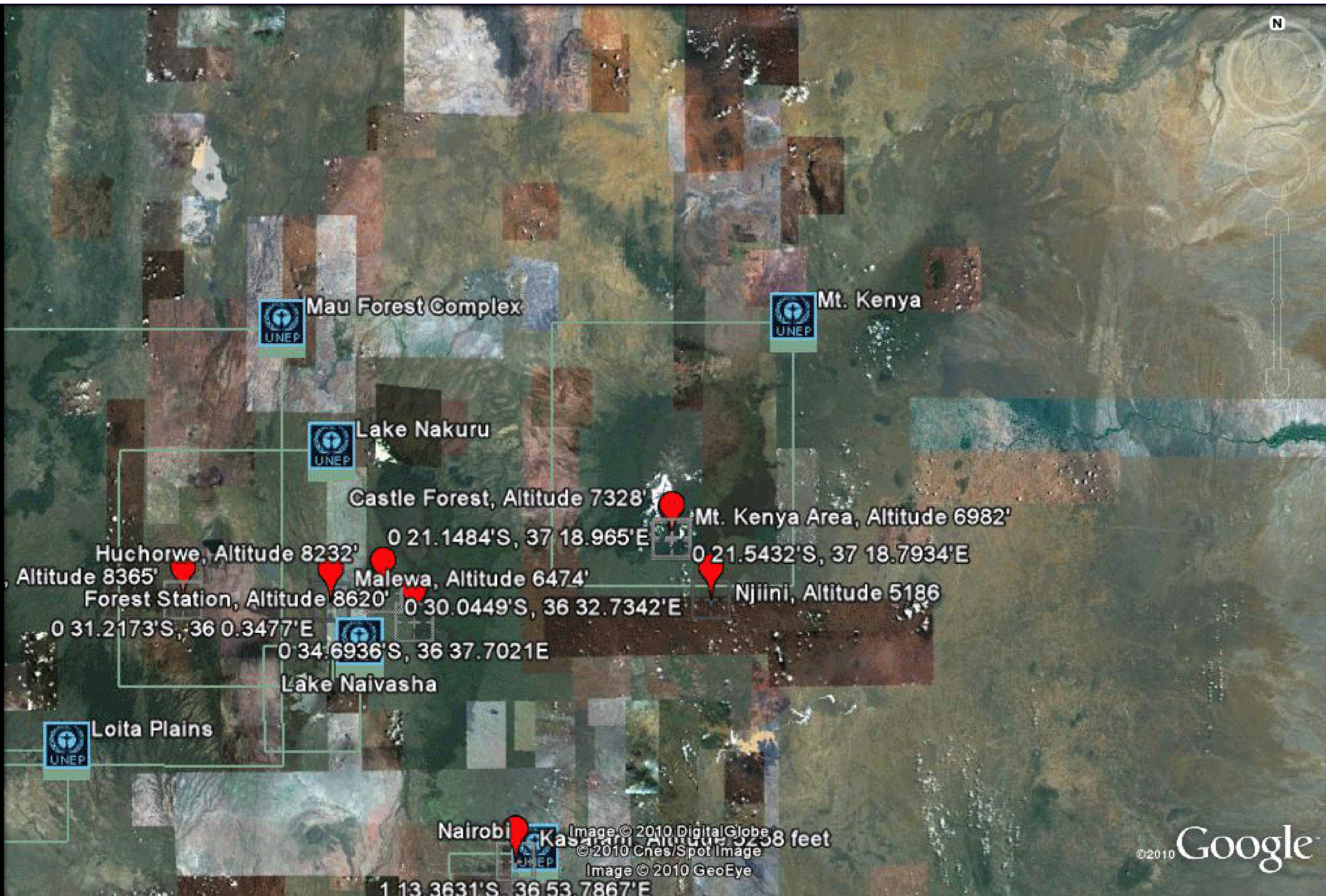

Figure 7. Mt. Kenya area supplemented with other data already onboard in Google Earth.

Similarly, Figures 8 and 9 illustrate other directions available to supplement field evidence acquired using GPS technology and subsequently embedded in Google Earth. Figure 8 delineates areas of change (three areas) surrounding Mt. Kenya. Figure 9 gives the reader an idea of the ruggedness of the terrain in the region.

Figure 8. Three areas of change (boxes outlined in yellow) in the region surrounding Mt. Kenya.

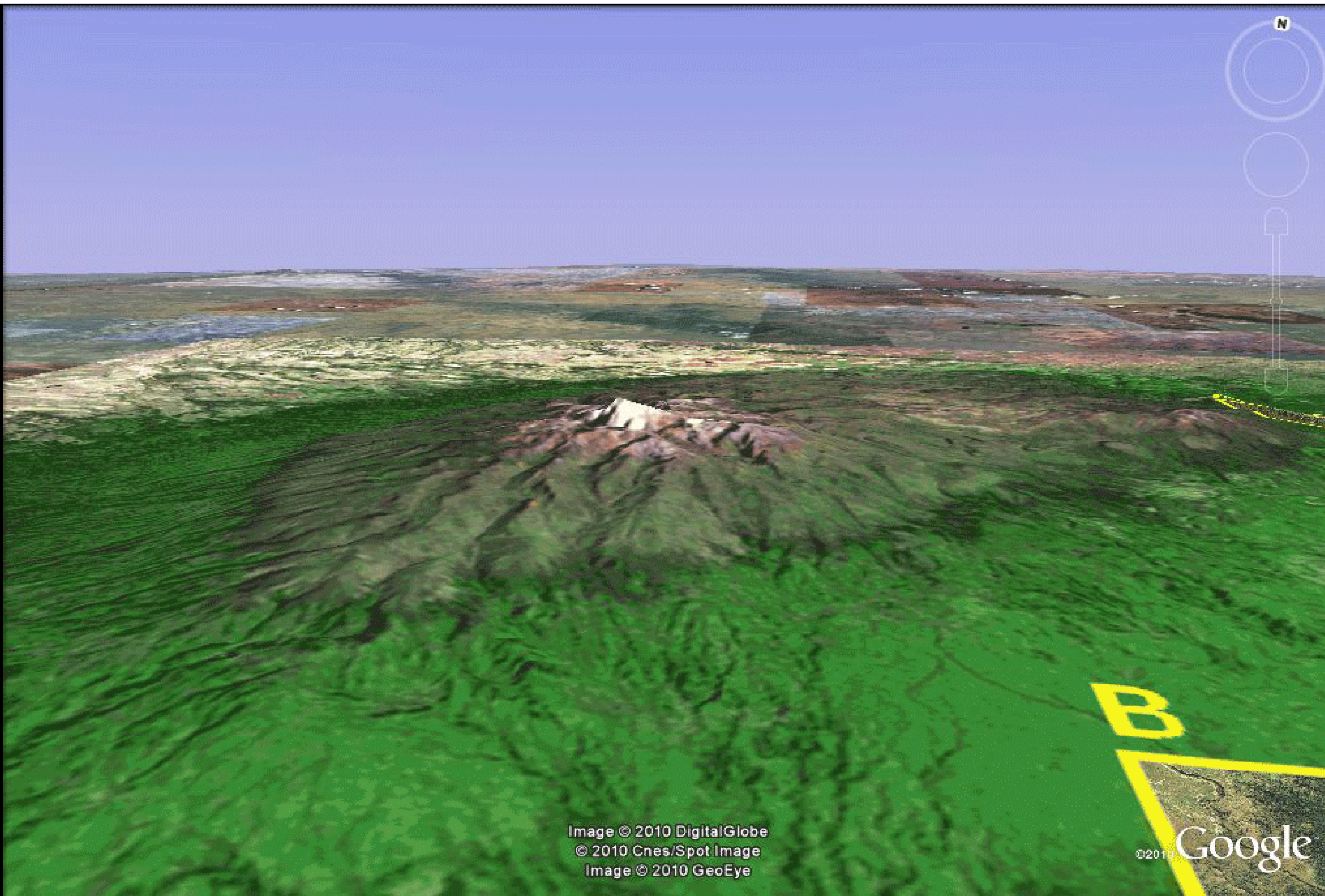

Figure 9. Ruggedness of terrain in the area around Mt. Kenya.

In a further similar survey (April-May, 2009) of 125 additional colonies located in the eastern, western and coastal regions of Kenya (69 colonies in 18 locations), coastal Tanzania (18 colonies in 4 locations) including Ugunja and Pemba Islands, collectively referred to as Zanzibar (likely A.m. litorea), and Western Uganda (14 colonies in 4 locations), 87% of the colonies tested positive for Varroa. Figure 10 is based on a map in Apidologie (Frazier, et al., 2010), subsequently translated to Google Earth using that map as an image overlay. Locations read from that map are coded as white balloons as it is not known precisely which of them has colonies with varroa. In the animation of Figure 10, the white balloons are displayed, as well, with the red ones from the GPS survey of selected locations. Among the white balloons, only the colonies surveyed in western Uganda and two of the Zanzibar colonies tested negative for mites. A limited survey of colonies in eastern Ghana (4 locations) found low numbers of Varroa in 2 out of 12 colonies sampled, suggesting that the mite has also spread to certain parts of West Africa.

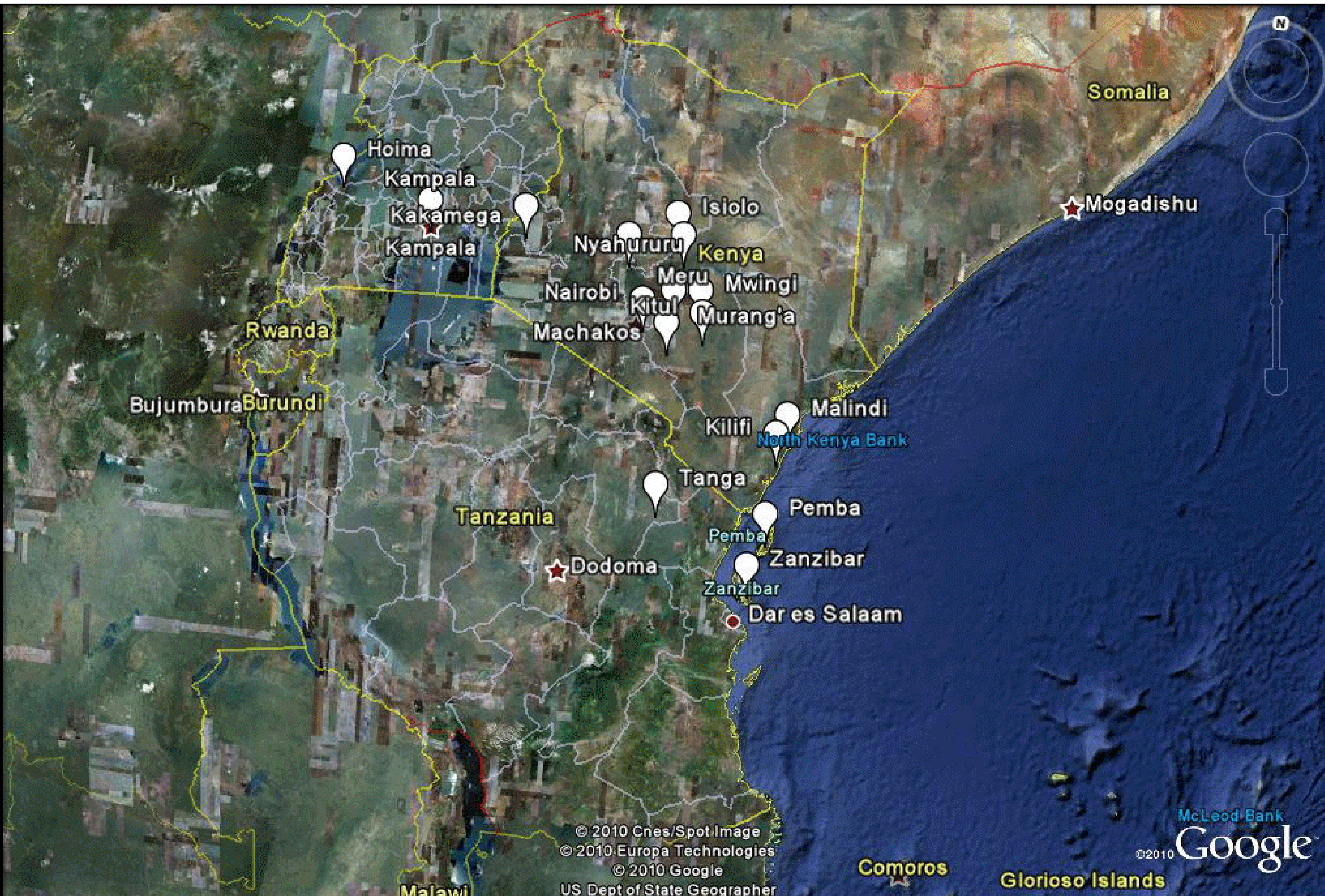

Figure 10. General data for Kenya, Uganda, and Tanganyika mapped in Google Earth from a paper map showing approximate locations of tested sites (Frazier et al., 2010).

The Global View, Revisited!

Animation of maps is a powerful tool for displaying spatial change over time. The simple layering of flat maps, adjusting successive animation frame spacing to correspond to real-world temporal spacing, can portray change effectively in a single view (as in Figure 1). More recent technology, however, permits the reader to do more than merely view the animation. The embedded "tour" of Google Earth lets the reader interact with a 3D display of Varroa distribution and experience directly the feeling of movement of that spread. One can dive into the display and see local imagery--stop the animation and extra navigation equipment appears; try your mouse buttons in various ways. Continue the animation after exploring a region; it will continue where it left off. One can also portray both global data, as in Figure 1, along with local data (as for Hawaii and Kenya in the other figures above) in a single display. The capability to adjust the image permits the simultaneous mapping of data at different scales. Further, the "tour" aspect of the display in Figure 11 emphasizes the global character of the distribution and helps to overcome the fact that less than half the Google globe can be in view at any one time. Test the interactive character of the imagery in Figure 11; travel with Varroa!

Figure 11. Travel with Varroa; maps at different

scales legibly displayed together.

The mapping strategy employed for Varroa, now well-established, might work equally well elsewhere. The small hive beetle is a new player. Initial mapping efforts offer promising views of the distribution of this pest (Neumann and Elzen, 2004; Neumann and Ellis, 2008). Perhaps the day will come when the onboard data set of fine tools, such as Google Earth has, will carry areas of change associated not only with vegetation and development issues, but also with changing wild life and agricultural populations including even the humble, but important, status of the honey bee!

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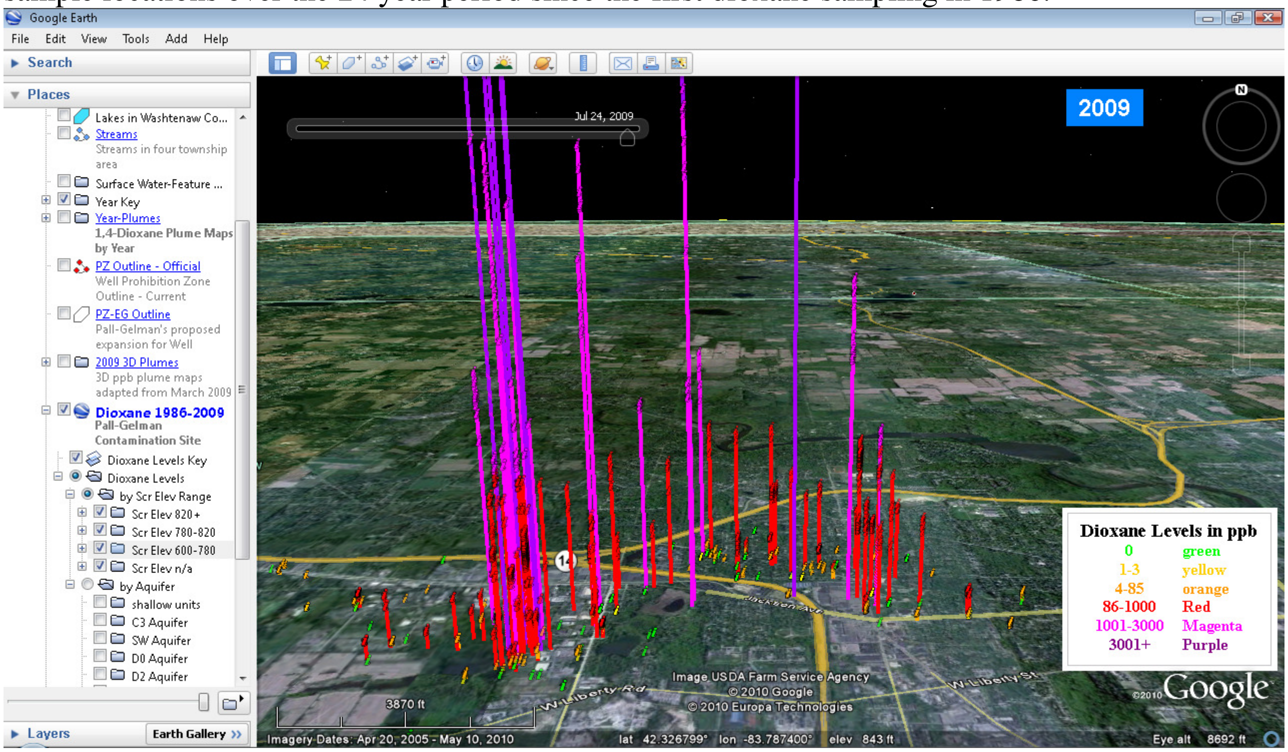
Google Earth: A Platform for Open Data

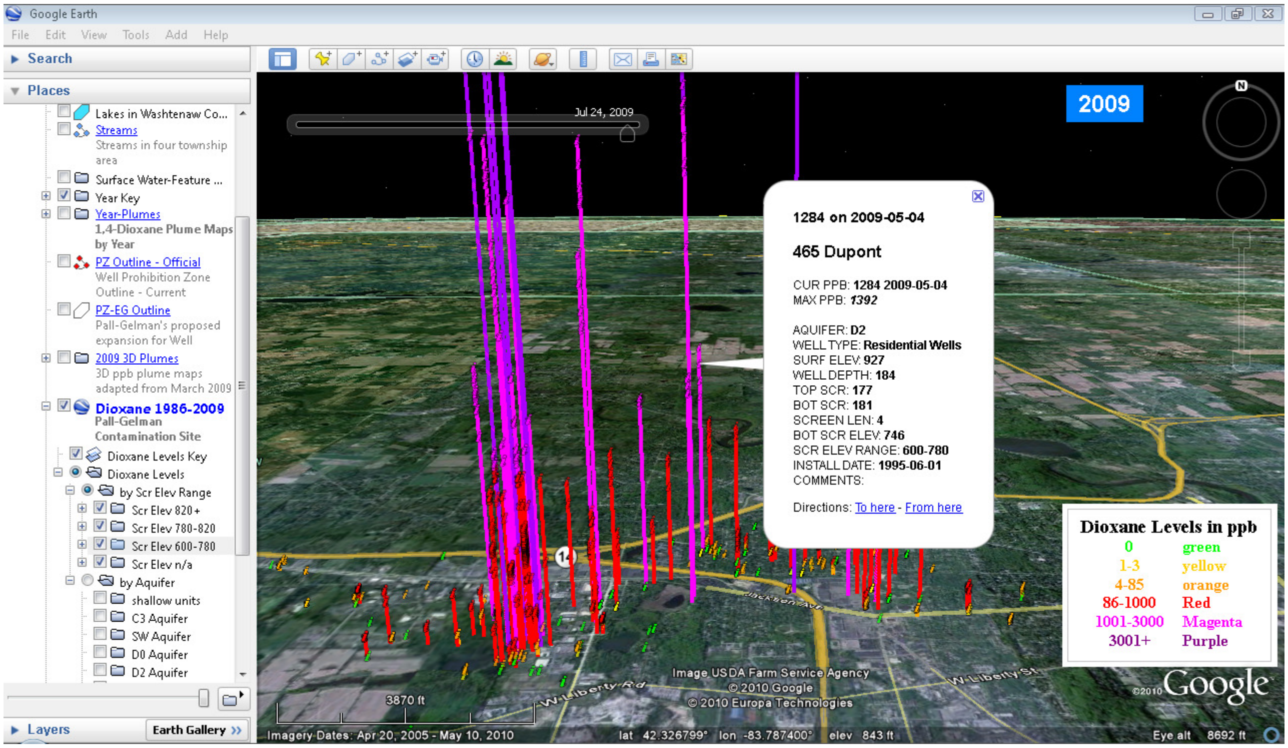
by Roger Rayle, CSF Associate

Google Earth allows one to mashup information from different sources. For example, I have loaded over 14,000 1,4-dioxane readings from the Pall/Gelman Contamination Site from about 400 sample locations over the 24 year period since the first dioxane sampling in 1986.



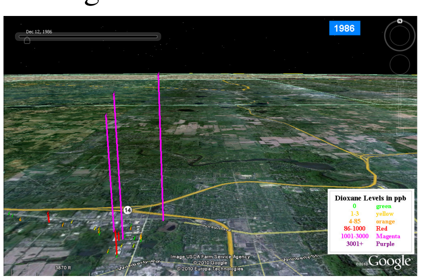
Each dioxane reading is shown as a placemark located at its sampled location and elevated above ground level 1 meter for each part per billion (ppb) of dioxane.

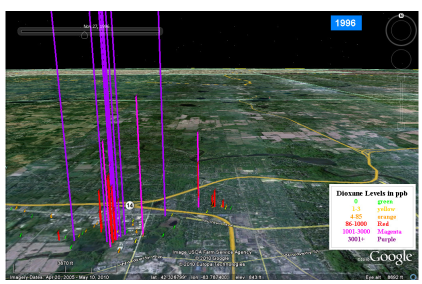
A bar extends from the elevated placemark to the ground forming an in-place bar graph of the dioxane readings. The bar is color-coded by ppb range to let the viewer know which are the higher bars even when the field of view cuts off the top of the bars.

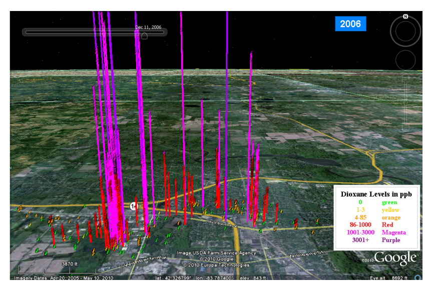


Clicking the "i = information" icon on a bar brings up a pop-up balloon with details about that one data point... Location, Date, ppb, Well depth, Screened Elevation, etc.

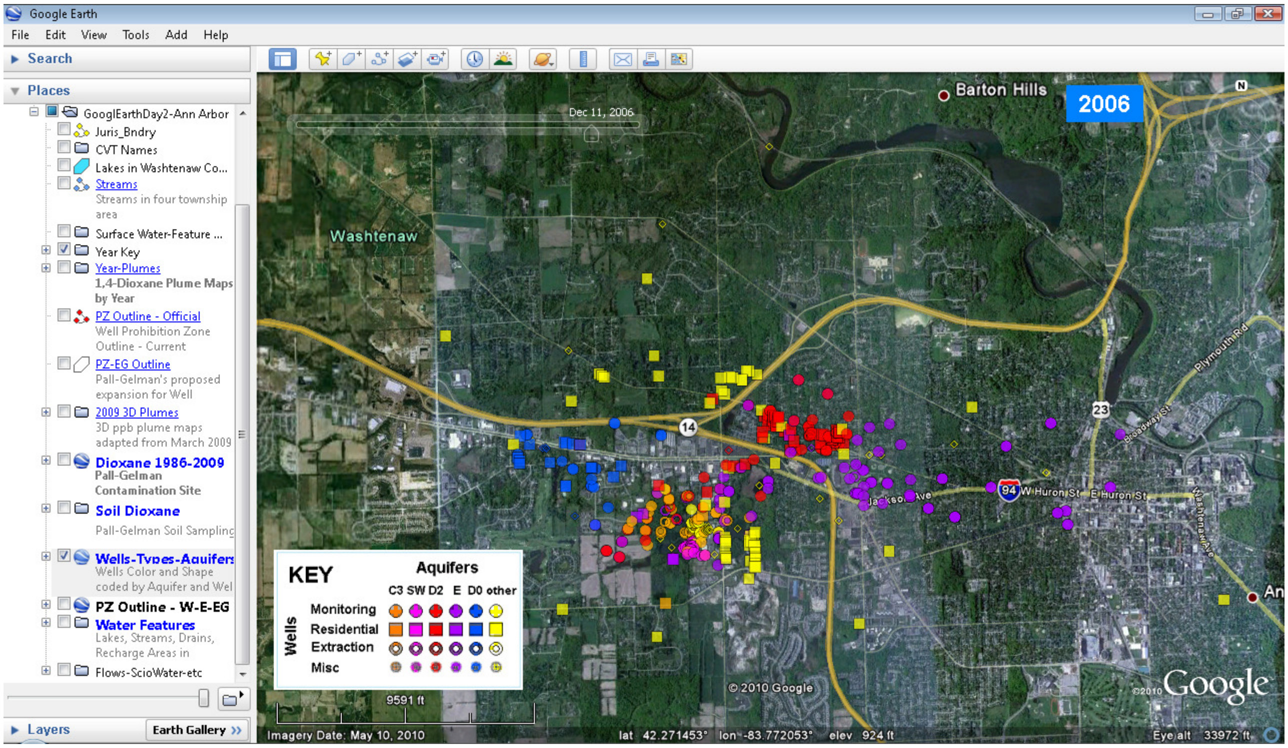
Each data point is time coded to appear at the proper time as the timeline at the top of Google earth is "played". A data point is coded to stay in view for up to a year unless another reading at that location supersedes it. The result is a 4-D bar graph showing the magnitude of where each dioxane reading occurred over time.



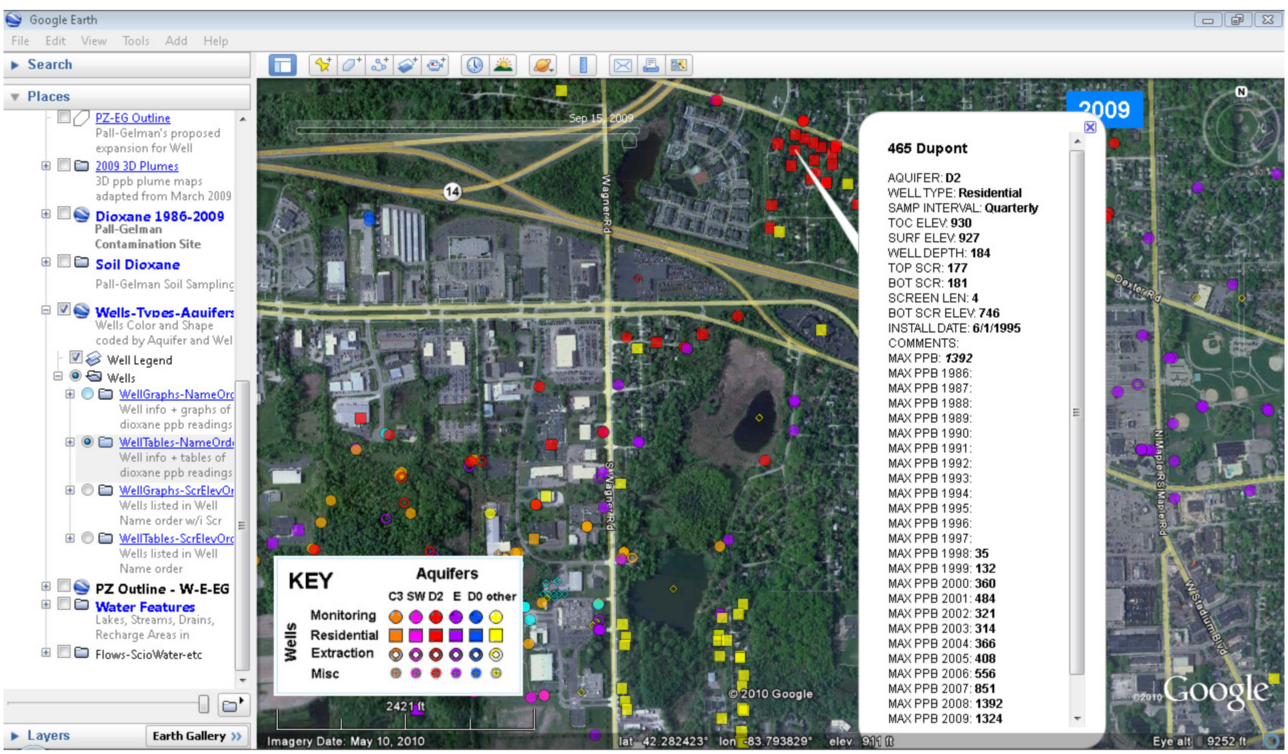


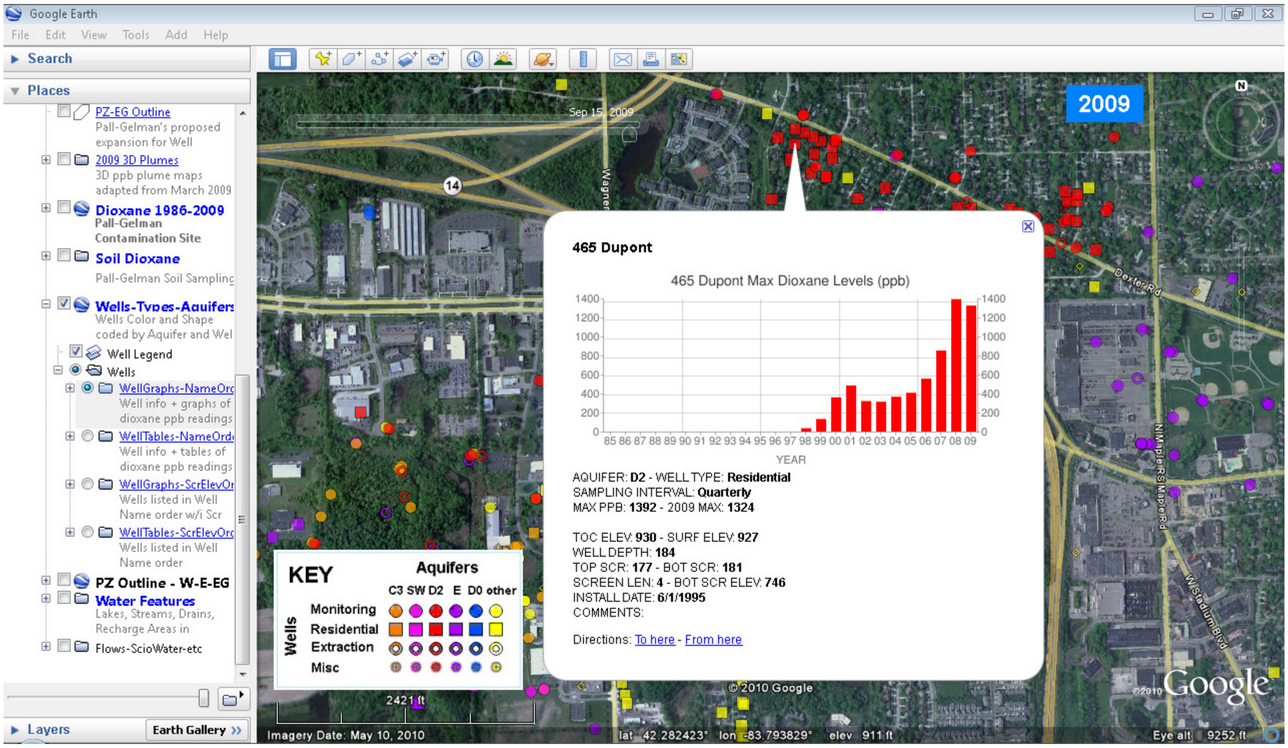


Another layer shows where all of the sampled locations (mostly wells) are, with each well/location icon color-coded by aquifer, and shape-coded by well type.



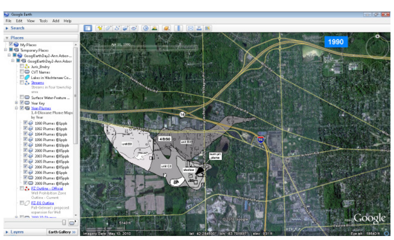
Clicking on an icon brings up a pop-up balloon with details about that sample location/well, e.g. Well Name, Ground Elevation, Screened Elevation, Date Installed, Maximum PPB, Maximum ppb per year, etc.

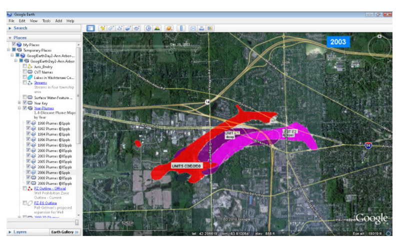


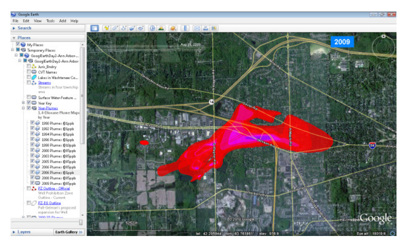


One version of this "Well" layer shows the maximum ppb readings per year in the balloon as a table... another versions shows them in a bar chart. (The bar chart version uses Google Charts API, thus requiring an internet connection to generate the chart in real time.)

Two-dimensional map images can also be overlaid as layers onto the surface of Google Earth. For the Pall/Gelman site, I have overlaid available yearly plume maps generated by the polluter, the

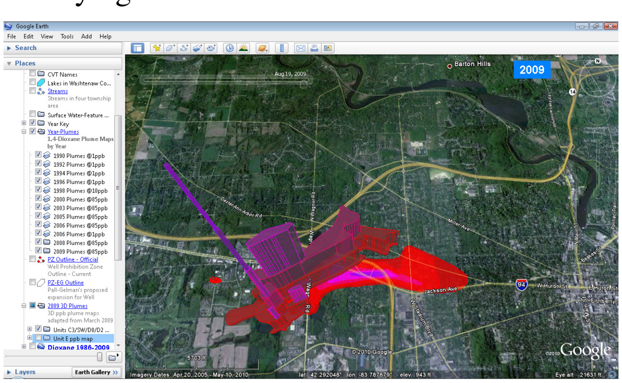


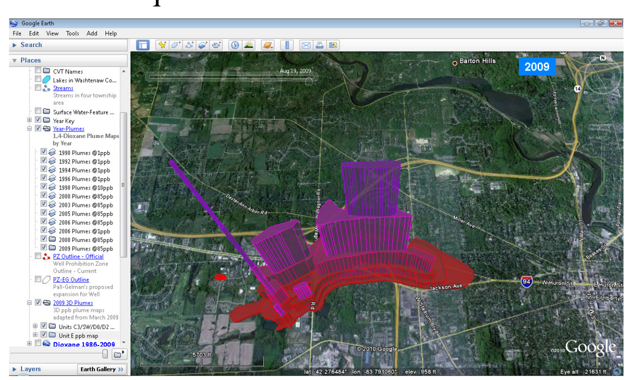




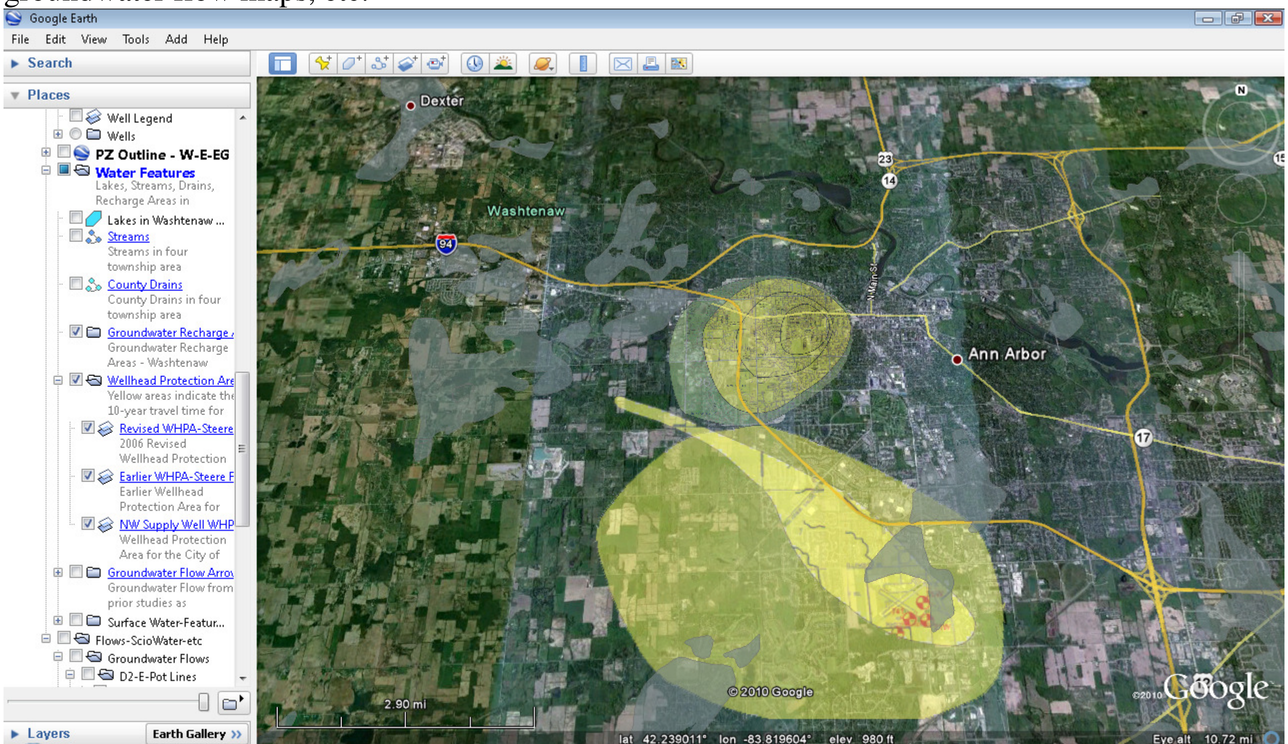
State, and the County to show dioxane plume changes over time..

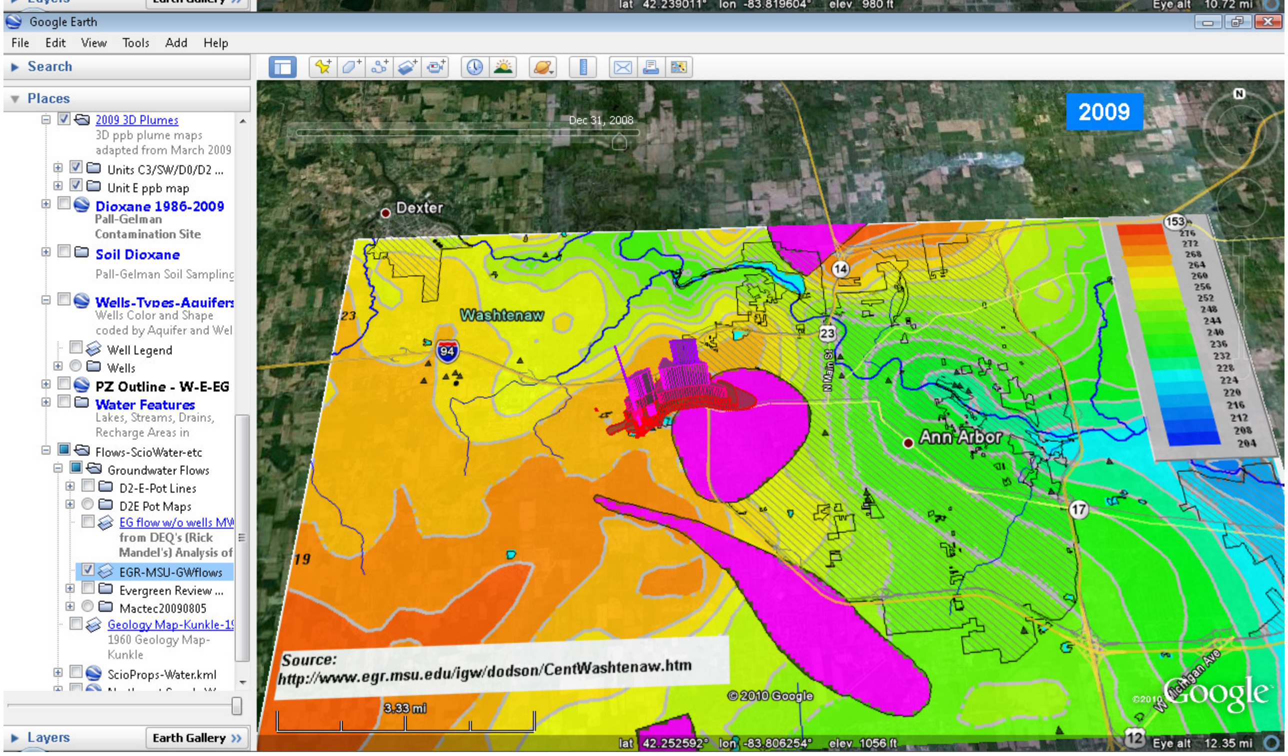
By extruding ppb iso-contour lines up to their appropriate levels, a 2D map becomes a 3D map, conveying more information on how much dioxane is in each aquifer set.

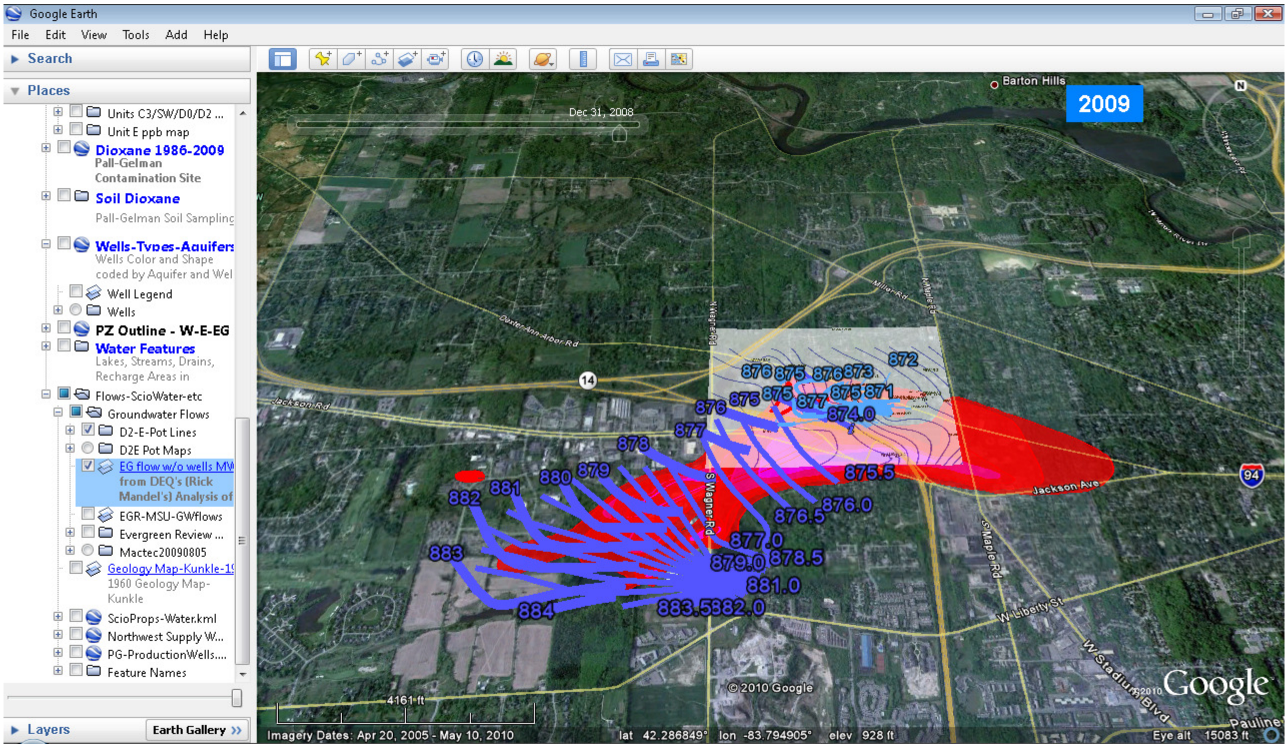




In addition, I have added layers for map images of wellhead protection areas for municipal well sources, images of groundwater recharge areas, images from geology maps, images from groundwater flow maps, etc.

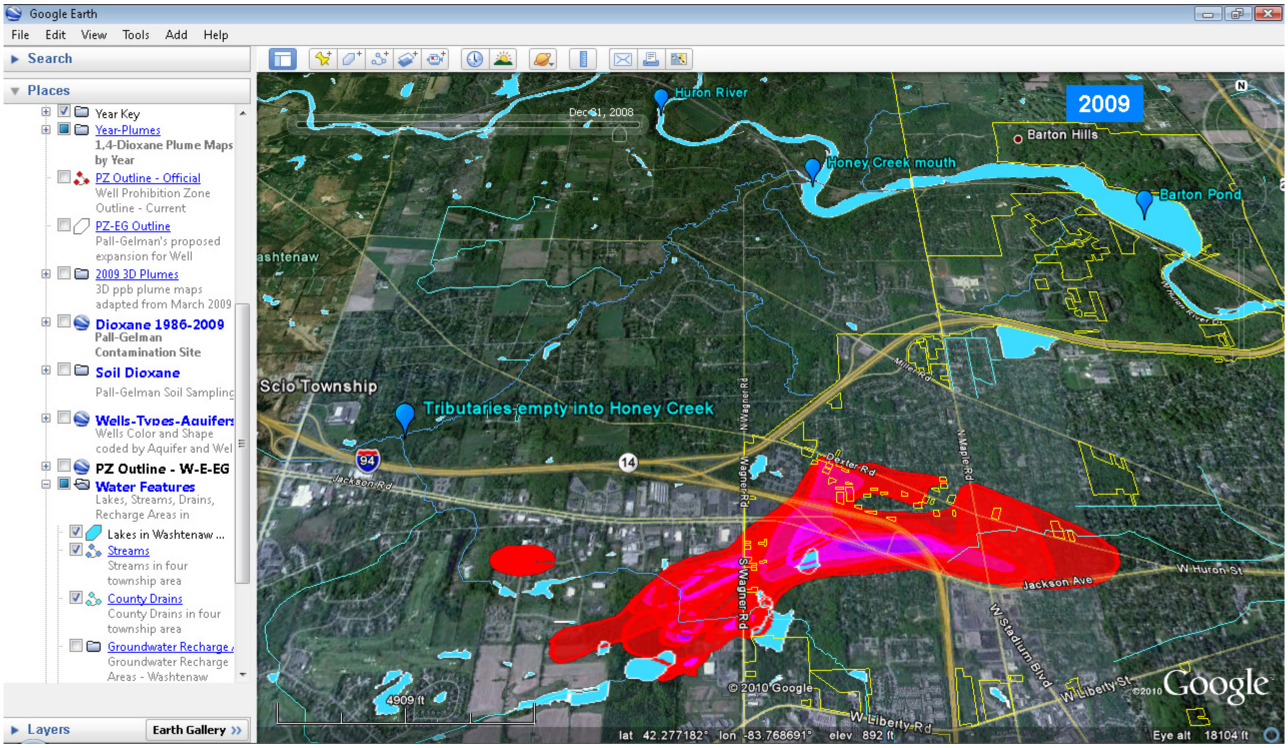




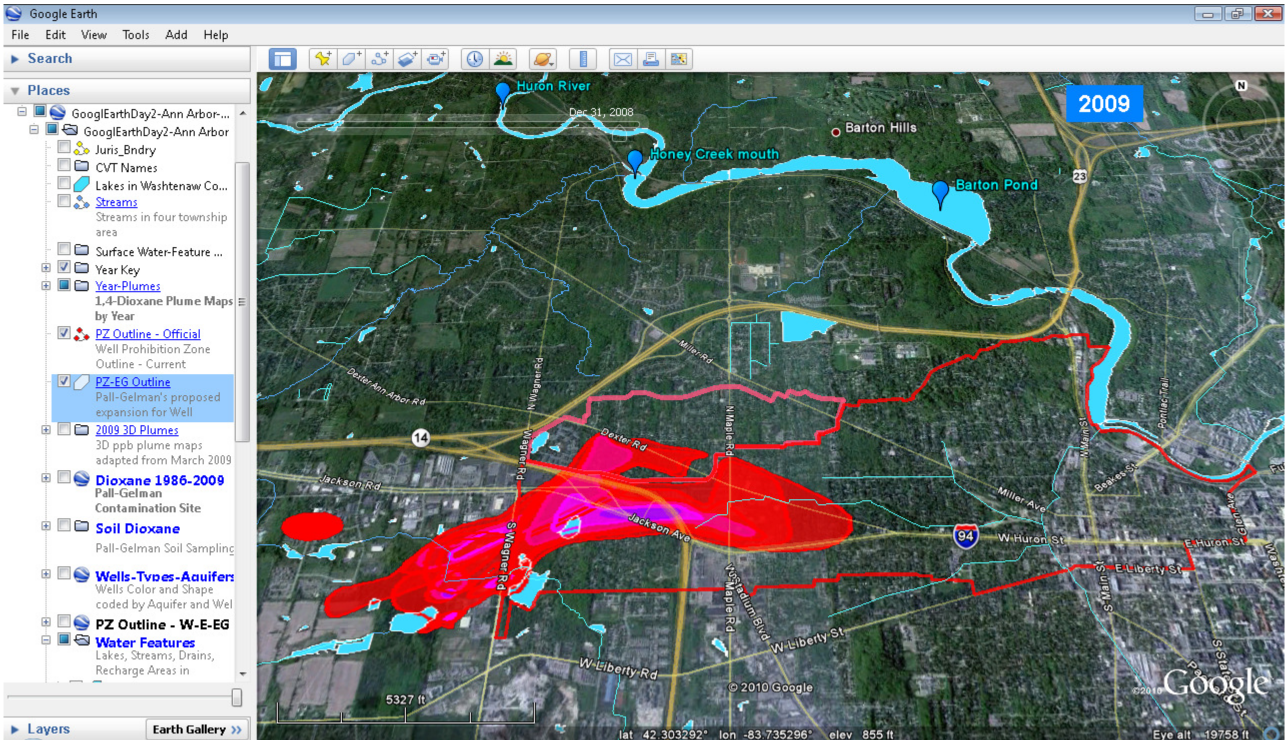


Most of these map images came from PDFs or scans of paper copies which had to be scaled and oriented properly onto Google Earth. Ideally, in the near future, such maps could come in electronically as KML files, pre-geocoded to open up as Google earth layers.

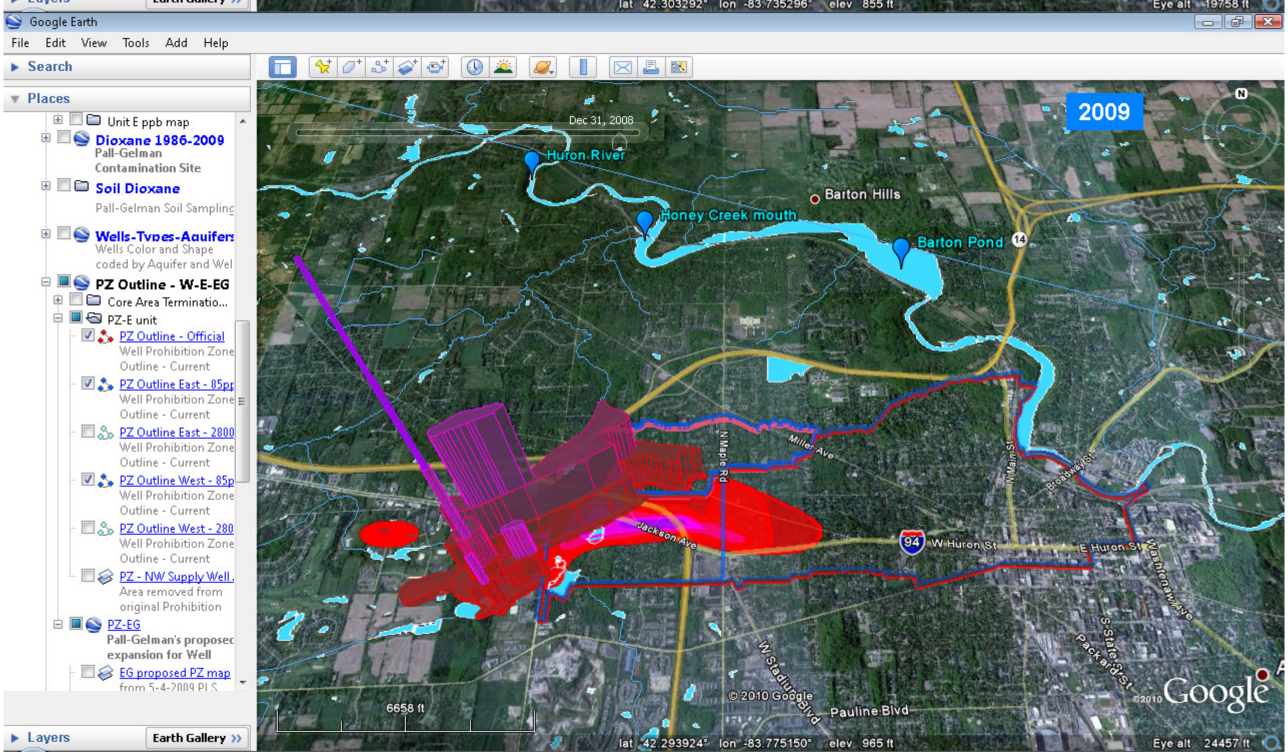
Some other local geographic feature layers have recently been available as KMLs from local government datasets, e.g. Water Bodies, Streams, County Drains, Municipal Boundaries, and of course, the Well Prohibition Zone (PZ) for the Pall/Gelman site.



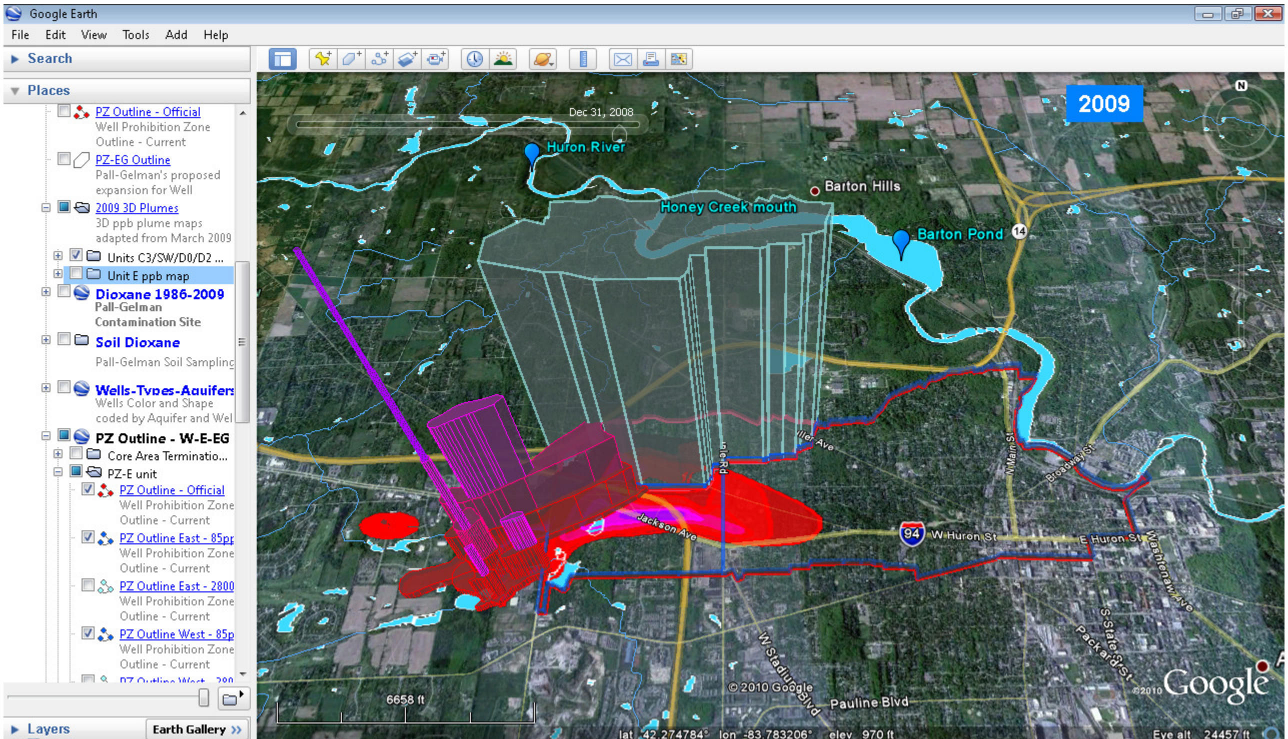
I have augmented the PZ layer to depict the various levels of cleanup required in and around the site by extruding the PZ boundary up to 3, 85, and 2800 meters (scale: 1 meter = 1 ppb) to show "boxes" laterally and "vertically" within which the dioxane is supposed to be contained.

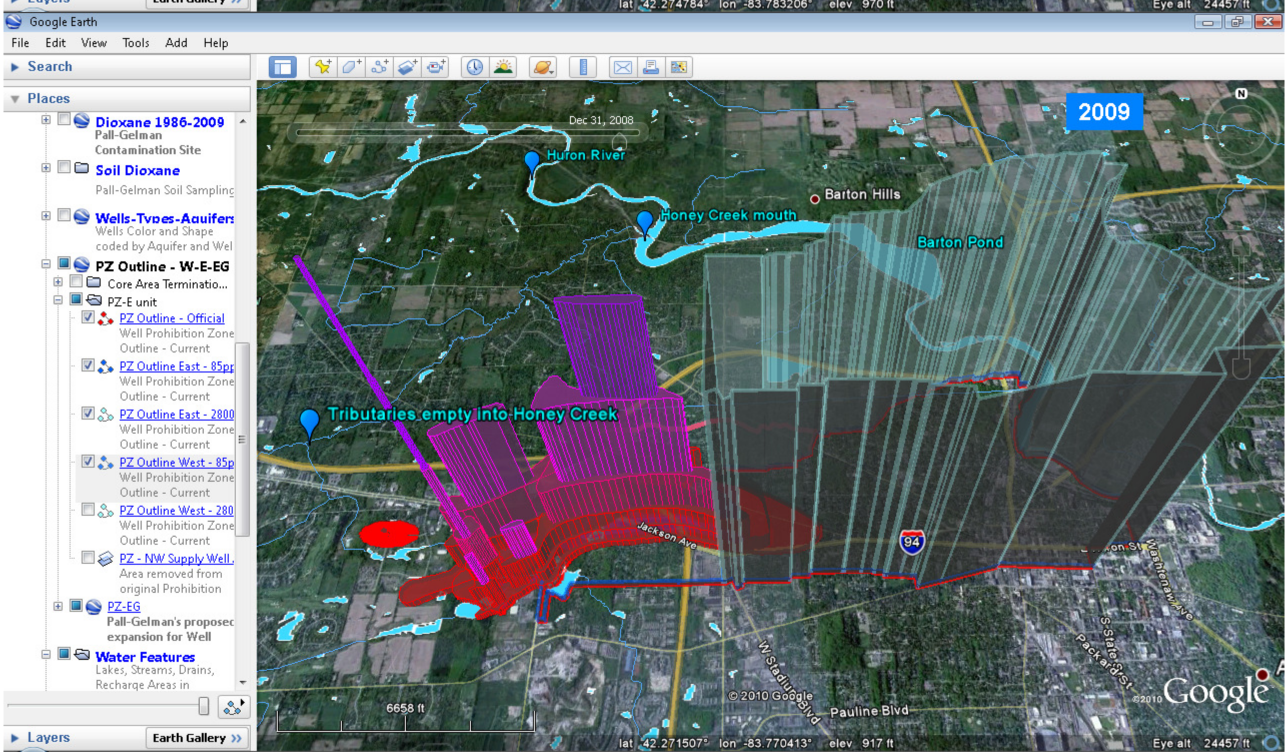


Google Earth
File Edit View Tools Add Help
Search
Places
GooglEarthDay2-Ann Arbor-...
GooglEarthDay2-Ann Arbor
Juris_Bndry
CVT Names
Lakes in Washtenaw Co...
Streams
Streams in four township area
Surface Water-Feature ...
Year Key
Year-Plumes
1,4-Dioxane Plume Maps by Year
PZ Outline - Official
Well Prohibition Zone Outline - Current
PZ-EG Outline
Pall-Gelman's proposed expansion for Well
2009 3D Plumes
3D ppb plume maps adapted from March 2009
Dioxane 1986-2009
Pall-Gelman Contamination Site
Soil Dioxane
Pall-Gelman Soil Sampling
Wells-Types-Aquifers
Wells Color and Shape coded by Aquifer and Wel
PZ Outline - W-E-EG
Water Features
Lakes, Streams, Drains, Recharge Areas in
Layers
Earth Gallery
2009
Dec 31, 2008
Huron River
Honey Creek mouth
Barton Hills
Barton Pond
Dexter Rd
Jackson Rd
Jackson Ave
Miller Ave
W Huron St
E Huron St
E Liberty St
W Liberty St
W Liberty Rd
N Maple Rd
S Wagner Rd
Stadium Blvd
5327 ft
© 2010 Google
lat 42.303292° lon -83.735296° elev 855 ft
Eye alt 19758 ft

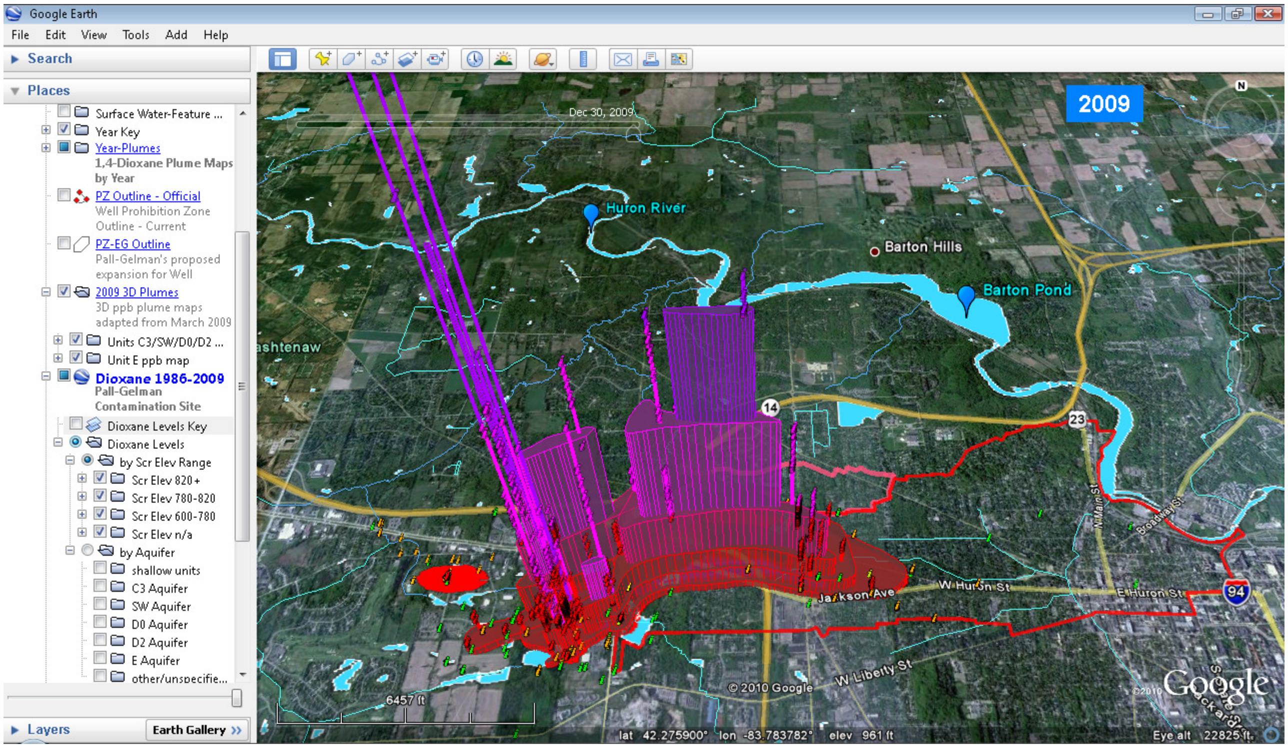


Google Earth
File Edit View Tools Add Help
Search
Places
Unit E ppb map
Dioxane 1986-2009
Pall-Gelman Contamination Site
Soil Dioxane
Pall-Gelman Soil Sampling
Wells-Types-Aquifers
Wells Color and Shape coded by Aquifer and Wel
PZ Outline - W-E-EG
Core Area Terminatio...
PZ-E unit
PZ Outline - Official
Well Prohibition Zone Outline - Current
PZ Outline East - 85pp
Well Prohibition Zone Outline - Current
PZ Outline East - 2800
Well Prohibition Zone Outline - Current
PZ Outline West - 85p
Well Prohibition Zone Outline - Current
PZ Outline West - 280
Well Prohibition Zone Outline - Current
PZ - NW Supply Well
Area removed from original Prohibition
PZ-EG
Pall-Gelman's proposec expansion for Well
EG proposed PZ map
from 5-4-2009 PLS
Layers
Earth Gallery
2009
Dec 31, 2008
Huron River
Honey Creek mouth
Barton Hills
Barton Pond
Miller Ave
Jackson Ave
N Maple Rd
W Huron St
E Huron St
W Stadium Blvd
Pauline Blvd
6658 ft
© 2010 Google
lat 42.293924° lon -83.775150° elev 965 ft
Eye alt 24457 ft

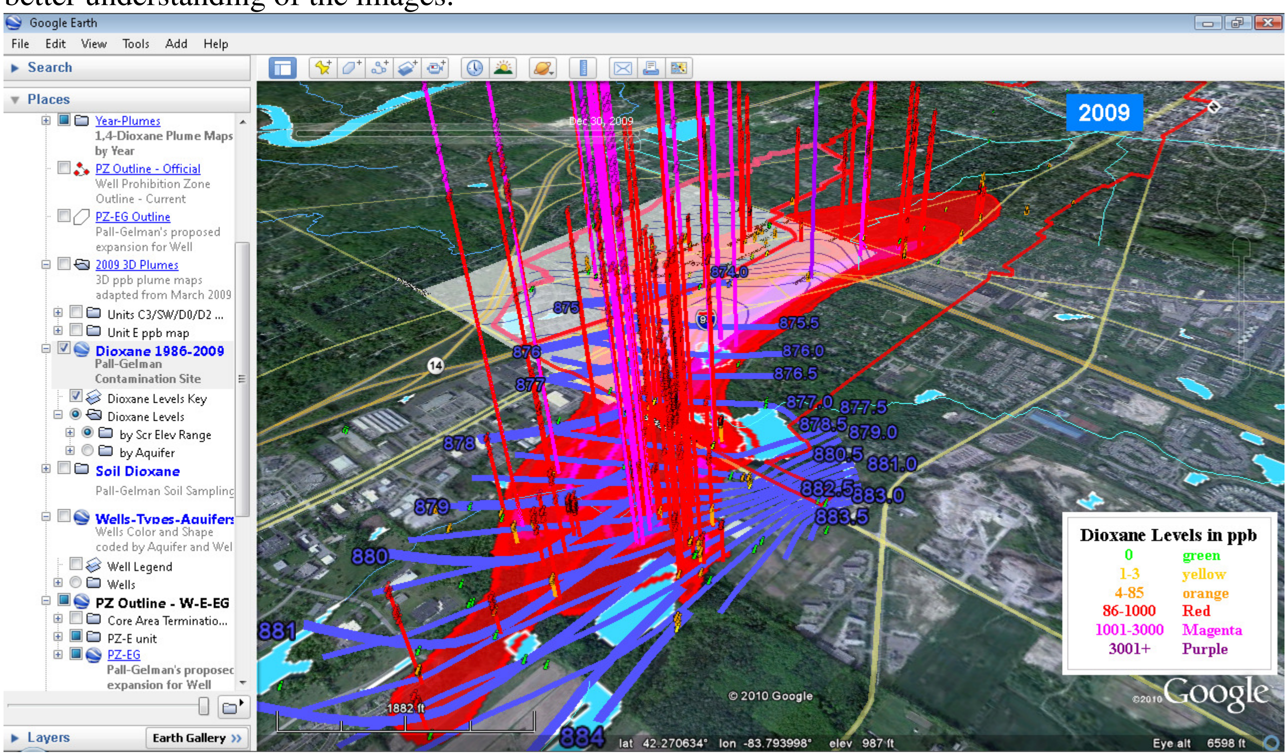




By mashing up all these various layers together, Google Earth provides an effective platform for decision making for complex situations.

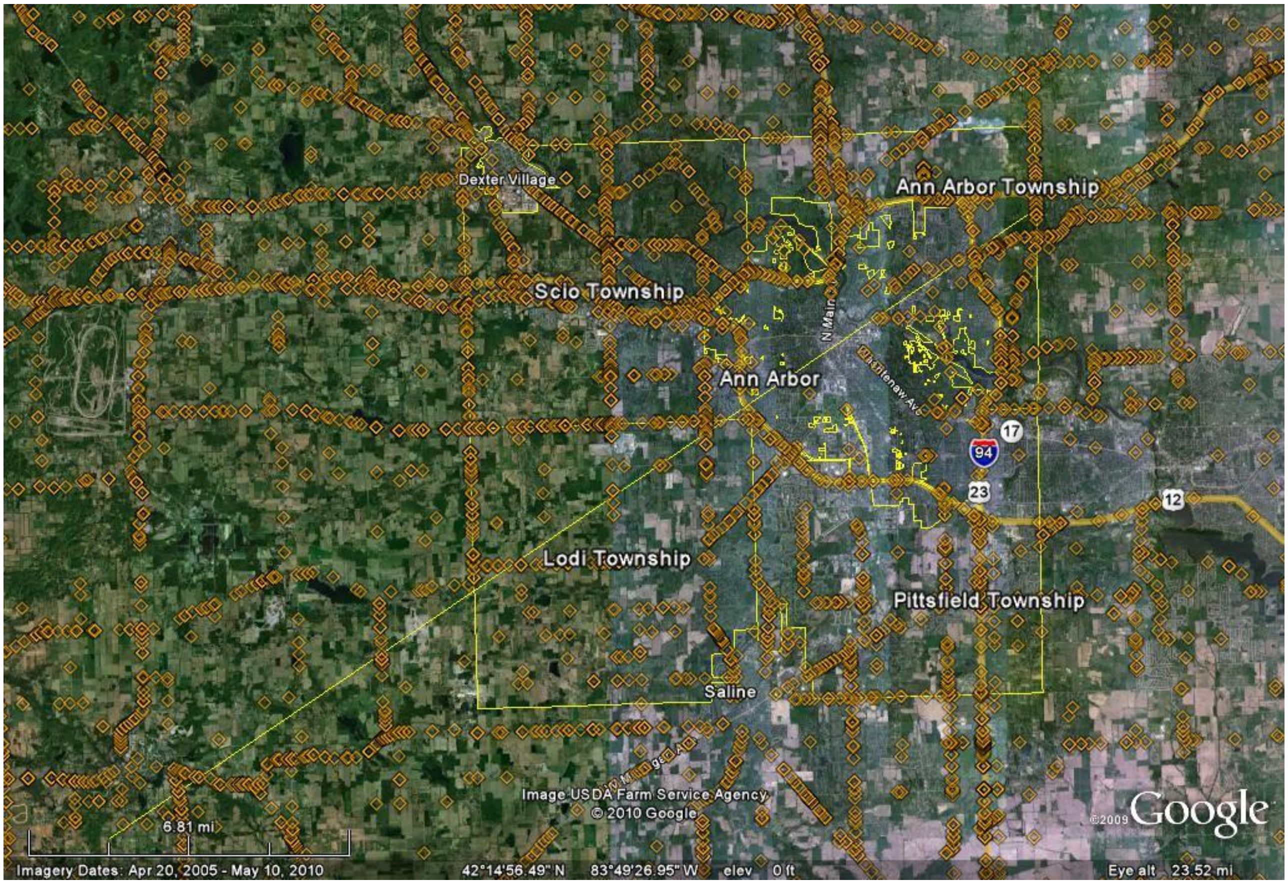


Furthermore, Google earth allows one to view chosen layers from any direction, range, and tilt for better understanding of the images.

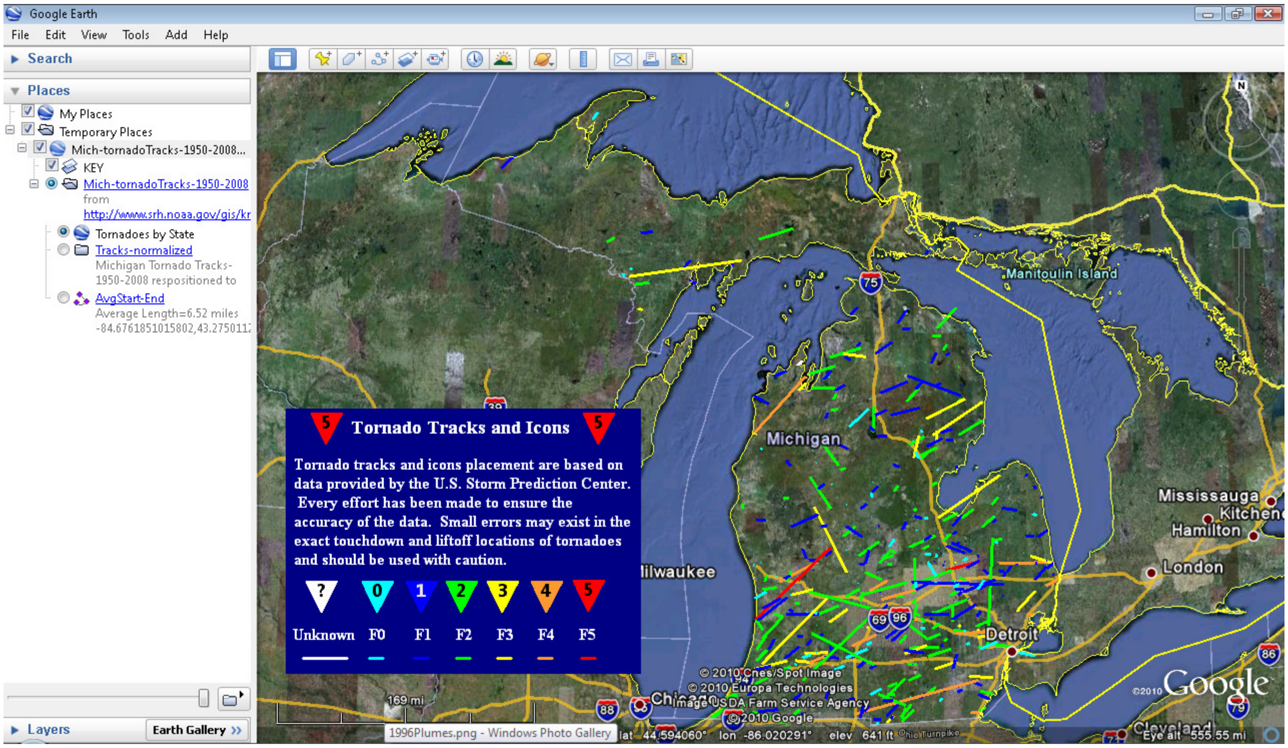


Google Earth is useful for depicting reality for more ordinary issues. Within recent months, I have mashed up publicly available datasets to address some current local issues:

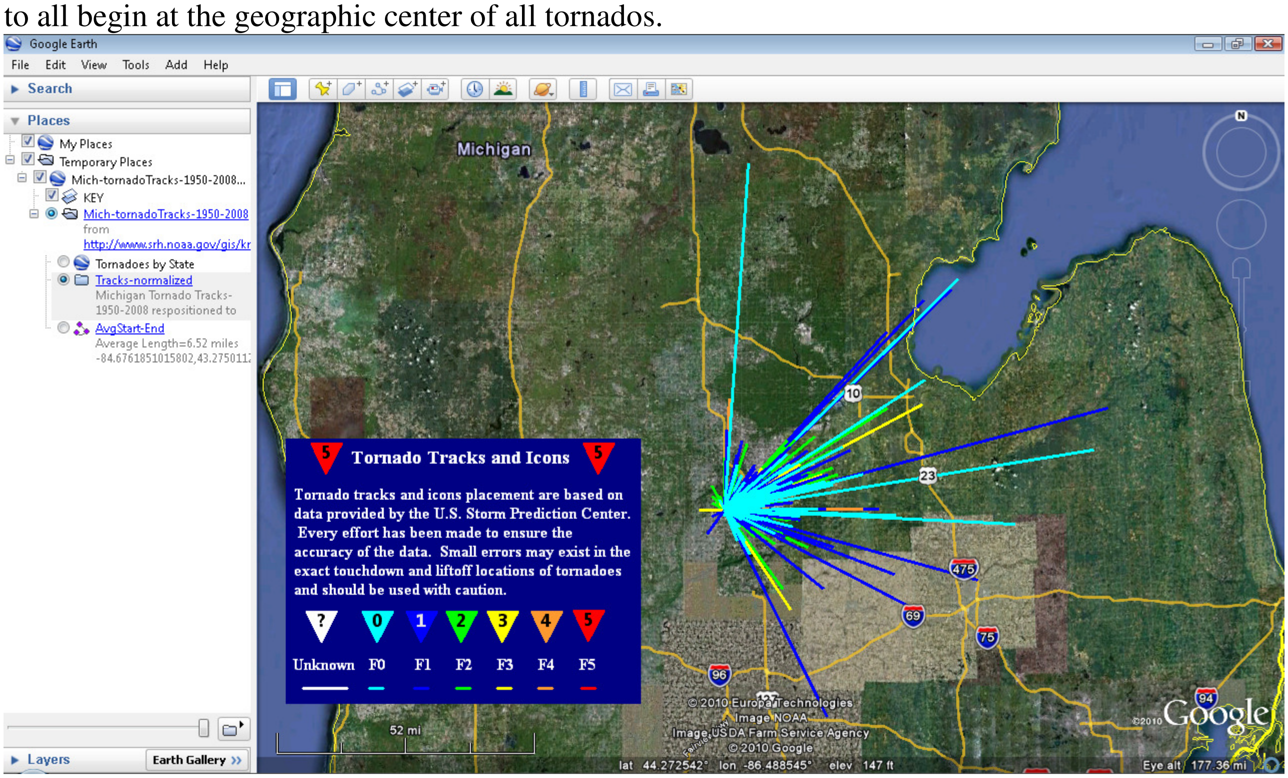
Car/deer incidents 2004-2008



Tornados in Michigan 1950-2008



To test the theory that most tornados come from the southwest direction, I shifted the tornado paths to all begin at the geographic center of all tornados.



This adjusted layer shows that only a small number of Michigan tornados end up west from where started and most do go northeasterly. However, some of the longer tornados went in unusual directions, e.g. straight north or south-southeast.

Some huge advantages of using Google Earth are that it is free, easy to use, widely available, already pre-loaded with periodically updated base layers, and easy to add one's own data layers, and easy to share the resulting mashups through various means.

In conclusion, Google Earth is an effective platform for depicting simple to complex datasets that have geographical elements. Even with the free version of Google Earth, one can make useful mashups of one's own data to create effective presentations and decision support tools, but the mashups are enhanced with the incorporation of relevant, publicly available, geo-coded datasets.

As more and more geo-coded datasets become available from forward thinking private and public sources, finding and incorporating these data as layers in one's Google Earth mashups will continue to be much easier. Relationships between various information layers will be more evident and the reality of situations covered will be easier to grasp.

Two major ongoing challenges often remain:

1. Getting appropriate public datasets geo-coded and shared in an "open" standard format like KML
2. Getting traditionally oriented decision makers comfortable using "open" data aggregating tools like Google Earth.

Portfolio of Current and Recent Projects, Sandra Lach Arlinghaus

CONNECTIONS:

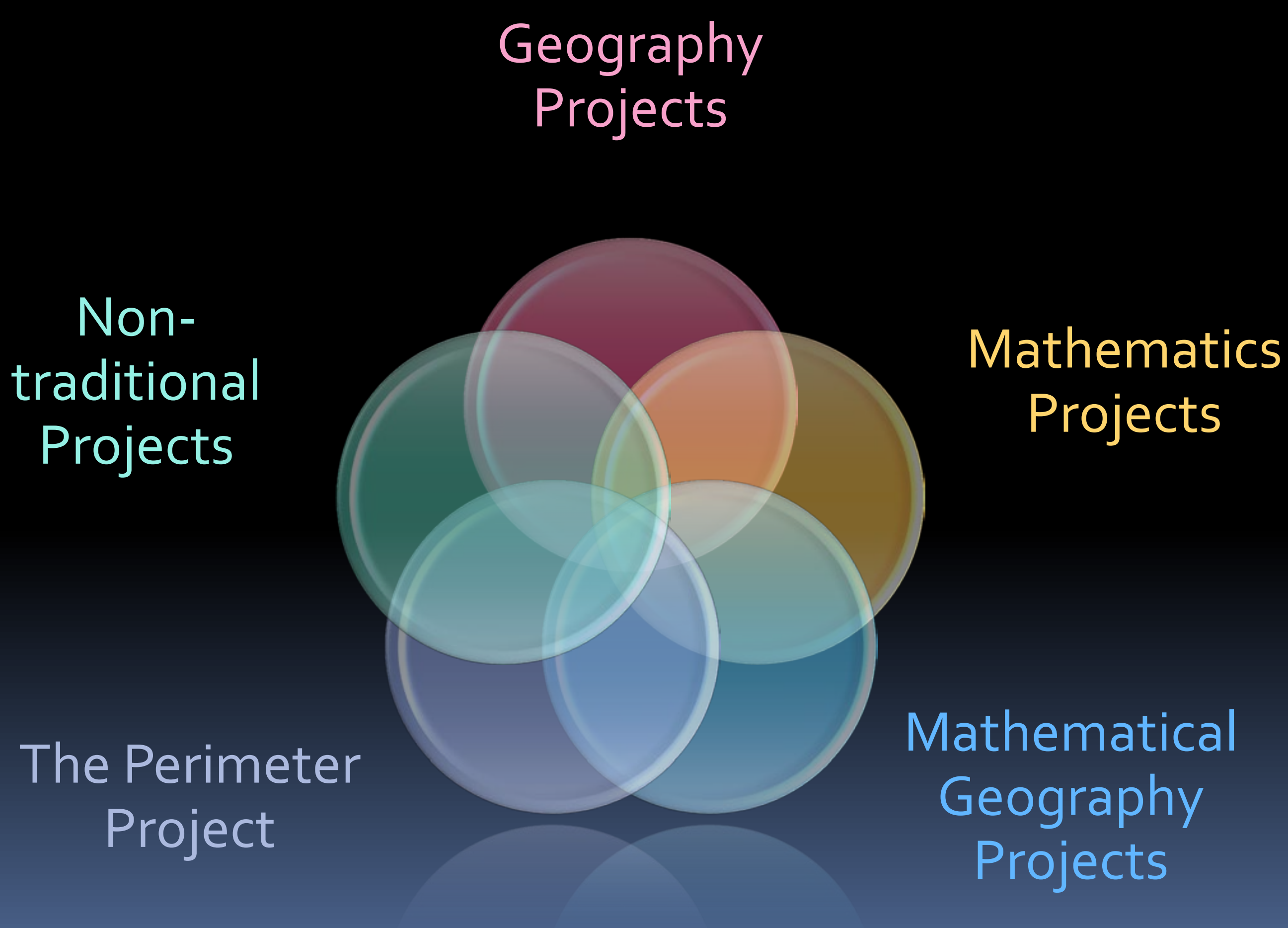
SCHOLARLY MULTI-TASKING IN A MOBILE VIRTUAL WORLD

General Vision

"Reflection-in-Action" (Schon, Drake, Miller, 1984) carries many varied and subtle meanings. What one does in scholarly and other effort reflects on all aspects of professional life and on the institutions one represents. Traditional and non-traditional, funded and non-funded, research projects form the context for this portfolio of projects.

Despite evident differences, all offer various styles of important *connections!*

Where does CSF fit?



Geography projects

Geographical Analysis

- Co-Editor, Special Issue on Graph Theory and Network Science
- Member, Editorial Board
- Reviewer

Non-Euclidean Fractals

With Mike Batty

- Article in Solstice, 2006
- Follow up article in Solstice, 2010

With Dan Griffith

- Presentation in Poznan, Poland, July 2010
- Publication of that presentation in Proceedings, Forthcoming
- Publication of that presentation in major Journal, Forthcoming

Geography Projects, Continued

CRC Series: Cartography, GIS, and Spatial Science (August, 2010)

CRC Revision of existing Manual

Possible CSF Connection

Making and Using Thematic Maps

Map Projections Handbook

Cartography and GIS: Applications in Mathematics and Mathematics Education

Geography Projects, Continued

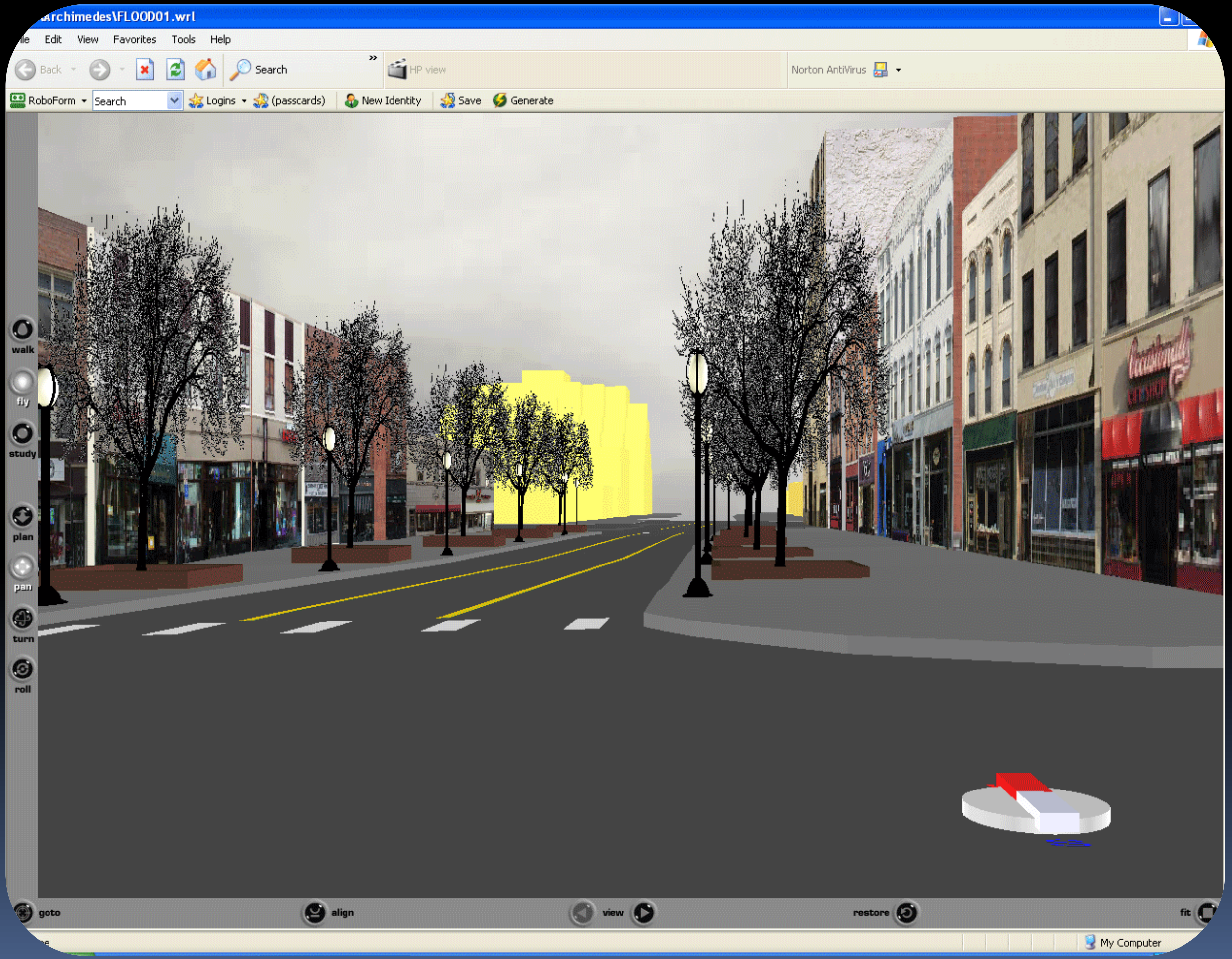
Diverse projects, summary on poster

Banda Aceh, CSF inspired

Honey bees, Diana Sammataro

3D Atlases of Ann Arbor, Matt Naud, Lars Schumann, et al.

Virtual reality: Ann Arbor



Mathematics Projects

Searches conducted online using "arlinghaus" as search term

Some links require a University of Michigan account to enter MathSciNet (or some other way to enter that passworded database).

- American Mathematical Society
  - Mathematical Reviews
    - Review author
    - Citation of authored material
  - Presentations
- Mathematics Education
  - MatheMaPics, with Joseph Kerski, 2010
  - Duplicate Bridge and Mathematics, with William C. Arlinghaus, forthcoming

Mathematical Geography Projects: IMaGe, 25 Years!

Institute of Mathematical Geography, IMaGe

- Monograph Series and E-books
- Solstice: An Electronic Journal of Geography and Mathematics
- Awards
- Press
- Papers
- Texts
- UM Deep Blue

The Perimeter Project: Phase 1.

Protect Fragile Lands using Cemetery Restrictions/Zoning

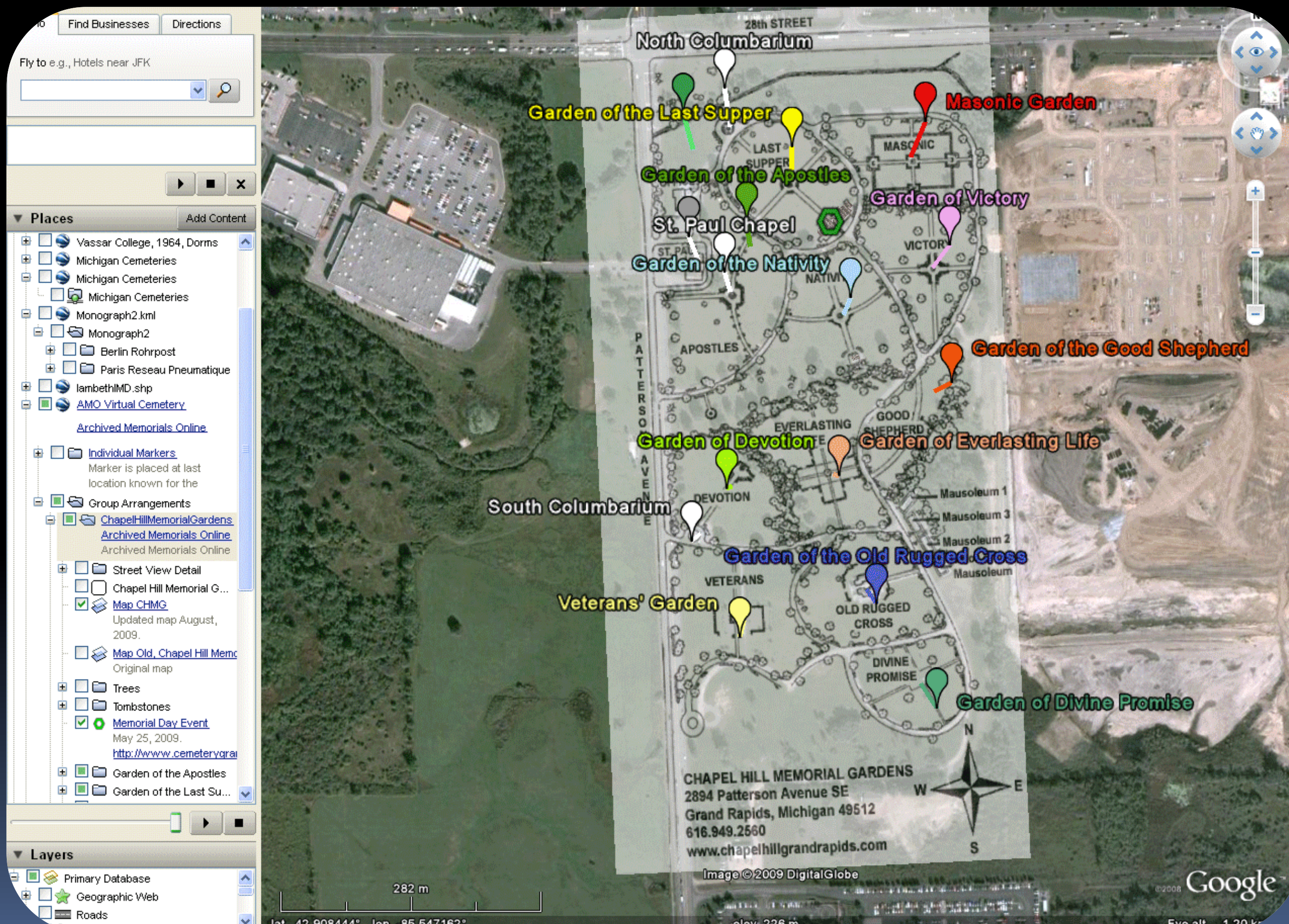
Pilot project: Chapel Hill Memorial Gardens, Grand Rapids. COMPLETE

- Bundling of Archived Memorials Online with sale of cemetery plots, cremation service, etc.
- Creation of Virtual Cemetery

Land acquisitions. IN PROGRESS

- Expansion of pilot project to other cemeteries
- Extension of idea to include golf course perimeter lands—viewing the golf course as a nation of 18 contiguous states.

View of the Virtual Cemetery



The Perimeter Project: Phase 2.

- Protection of land/water interface.
- Great Lakes, or regional level.
- National level.
- International level; possible CSF involvement. Possible UM CVC involvement (Pacemaker recycling—Dr. Kim Eagle, Dr. Timir Baman).

Non-traditional Projects:
American Contract Bridge League (ACBL)

ACBL: non-profit organization of 160,000+ members, headquartered near Memphis.

- 2010: Chair, ACBL Technology Committee.
- 2008: Co-chair, North American Bridge Championships, Renaissance Center, Detroit.
- Aileen Osofsky Memorial website—link.

2011: Co-chair, United States Bridge Federation Women's and Seniors' Trials, Renaissance Center, Detroit.

- Visited 2010 Team Trials in Chicago, leading to trip with Jan to University of Chicago.
- Visited ACBL Building dedication ceremony following Team Trials

Non-traditional Projects:
Reunions

Webmaster for graduating classes

- Vassar College
- University of Chicago Laboratory Schools
  - 2010: Jan Friedman Martel—attended luncheon where she gave awards and medals to the University of Chicago
  - 2010: Ed Loosli-- Chairman, The Wildlife Foundation-Kenya; President, The Wildlife Trust, USA

Non-traditional Projects:
Music

Connections among music, mathematics, and geography

- Article, 2004, in Solstice with Braxton Blake
- Music in Spatial Synthesis
- Music applied to some of Michael Batty's data.
- Ongoing collaboration with Blake and others.

Non-traditional Projects: Animated Cards

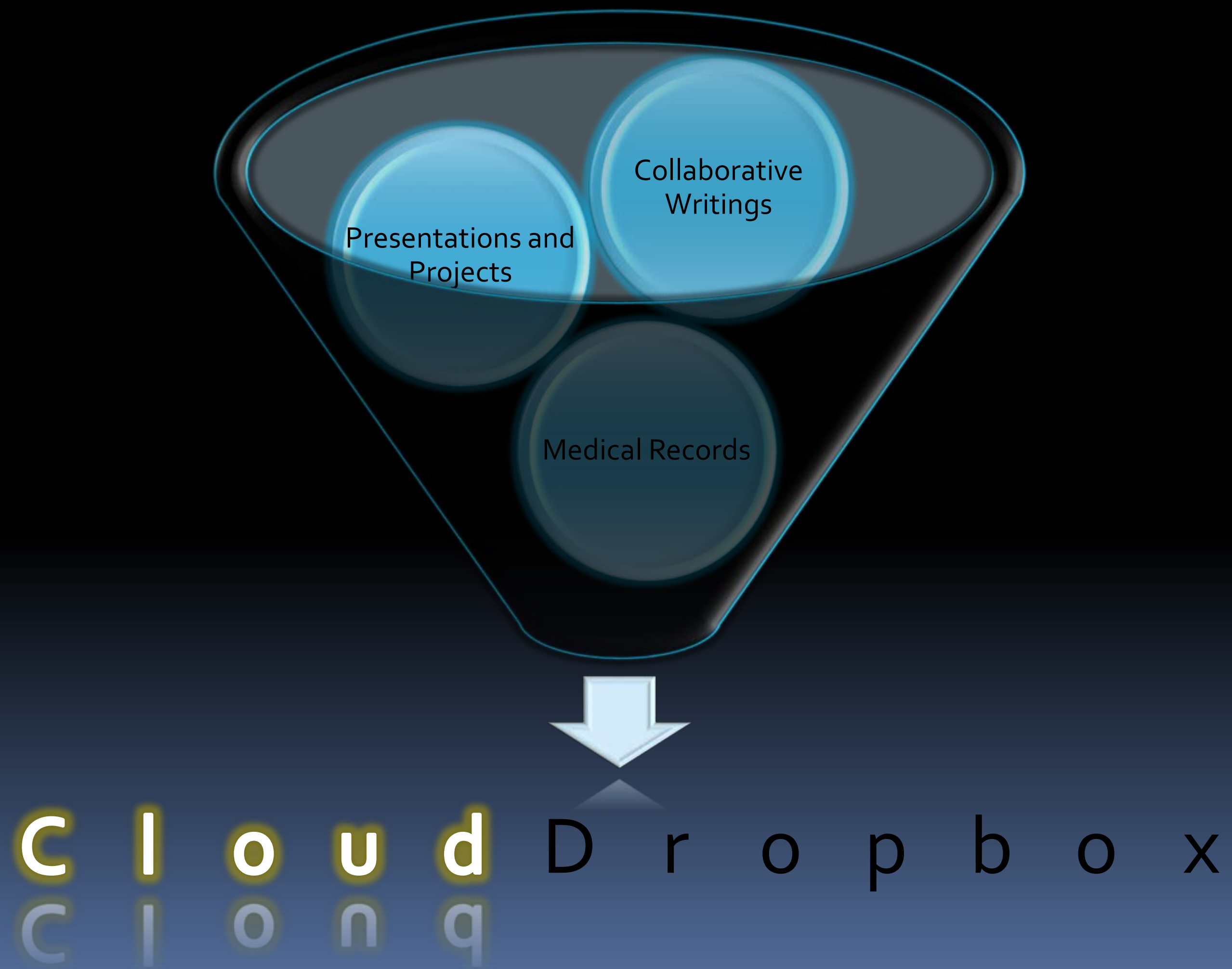
Ecards: one used to promote Vienna Philharmonic—sample.

- Recent trip to New Orleans to North American Bridge Championships
- Suggested making teddy bear jazz band on Natchez paddlewheeler on the Mississippi River to promote New Orleans' recovering economy.
- Connection with the Provost of Tulane University yielded a set of names of local charities to consider for promotion

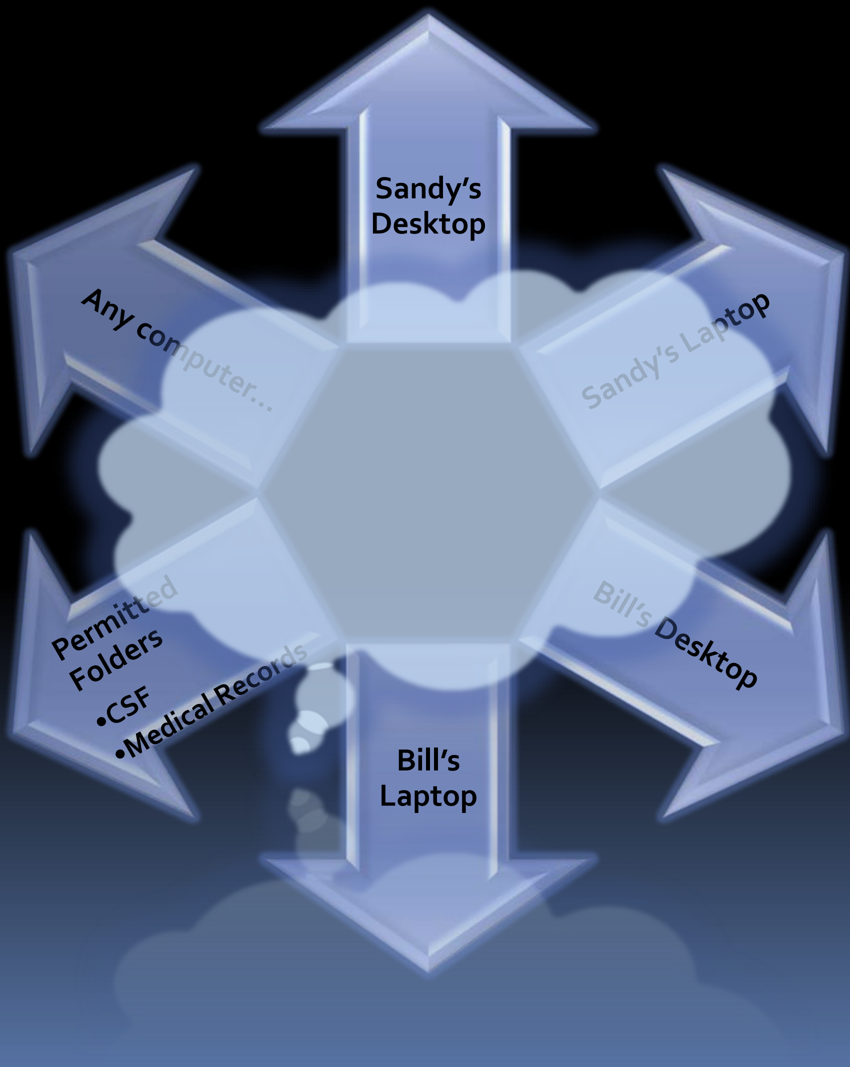
Card maker is considering the New Orleans suggestion.

If card maker follows through, then will suggest they go global with it, to identify and reward communities making substantial local recovery from disaster. Possible CSF involvement.

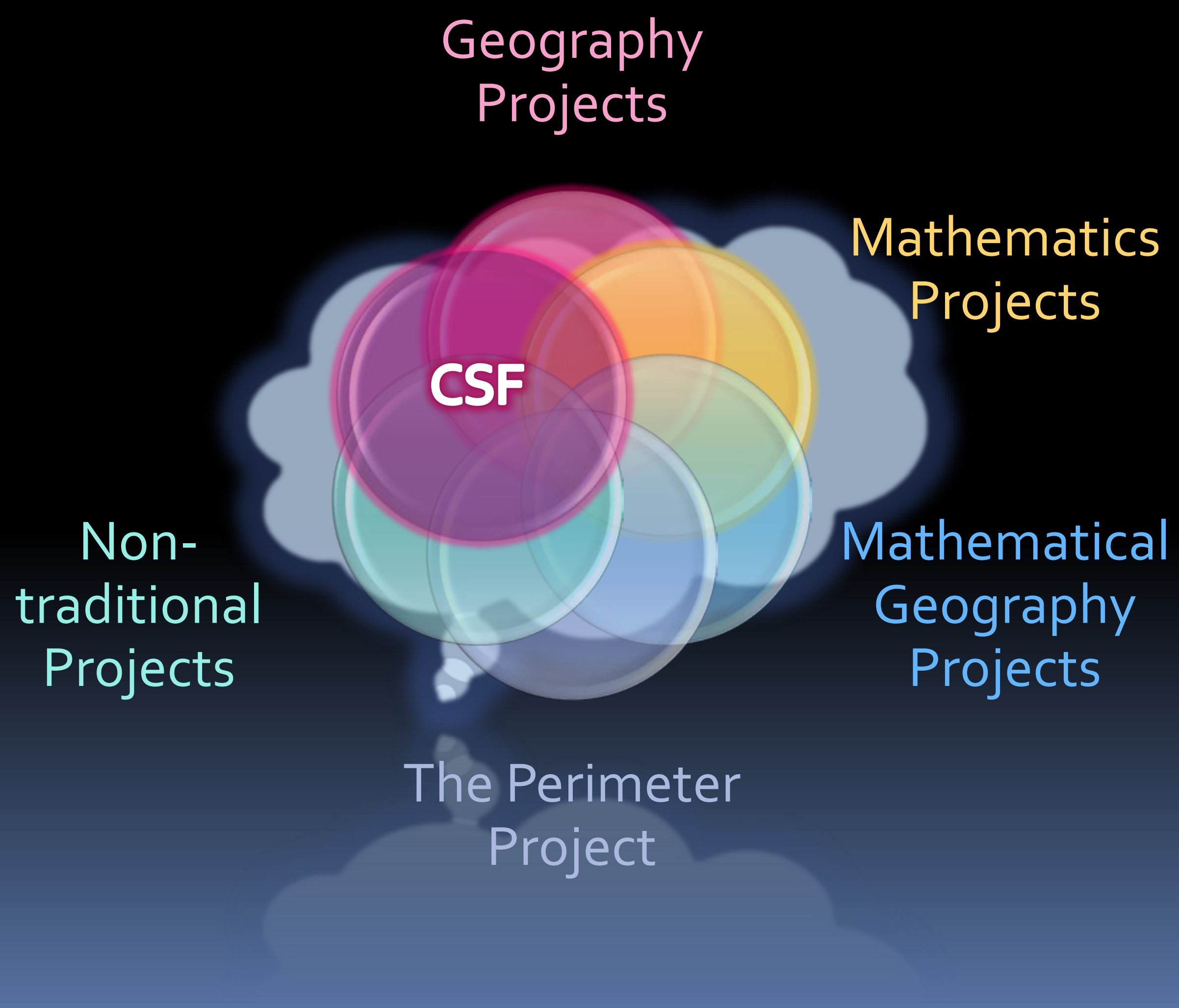
Non-traditional Projects:
Cloud Computing



Non-traditional Projects:
Cloud Computing



CSF may fit with parts of each set!

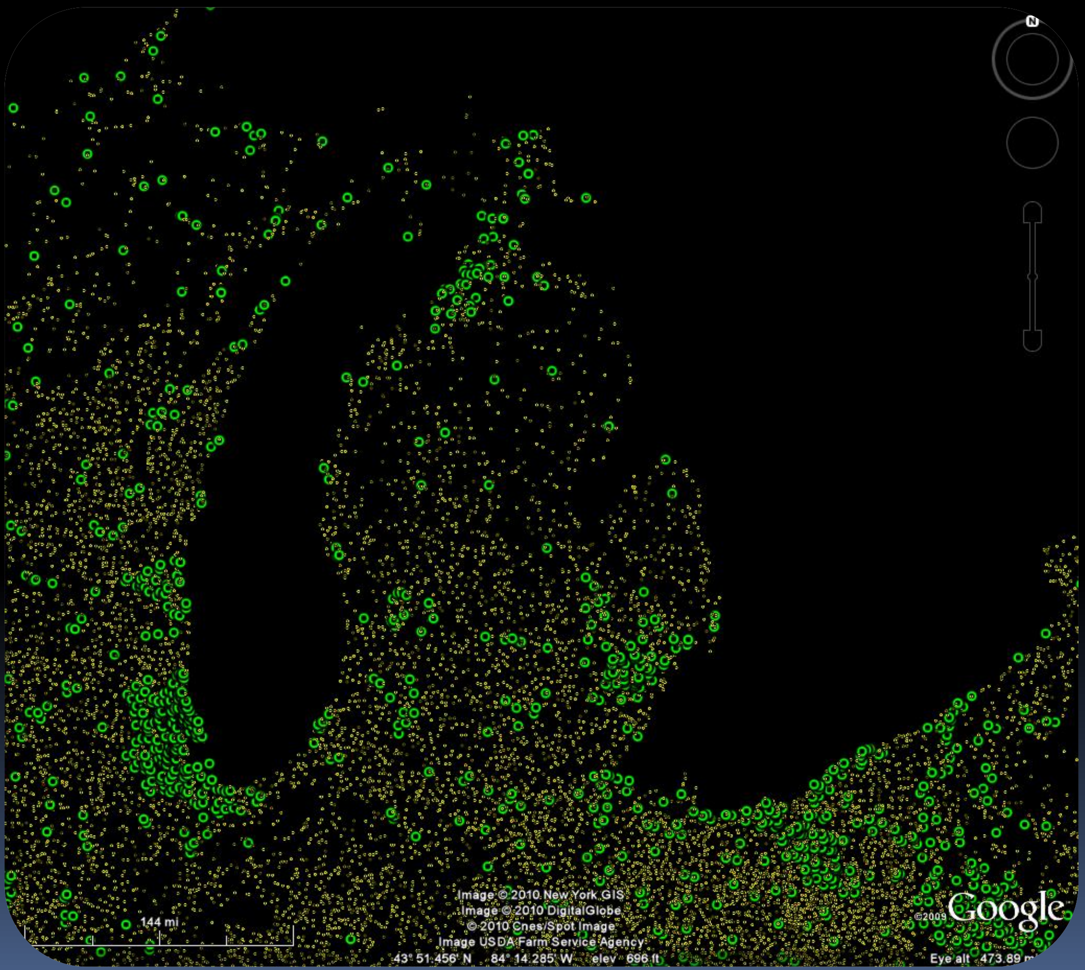


A Closer Look . . . . The Perimeter Project

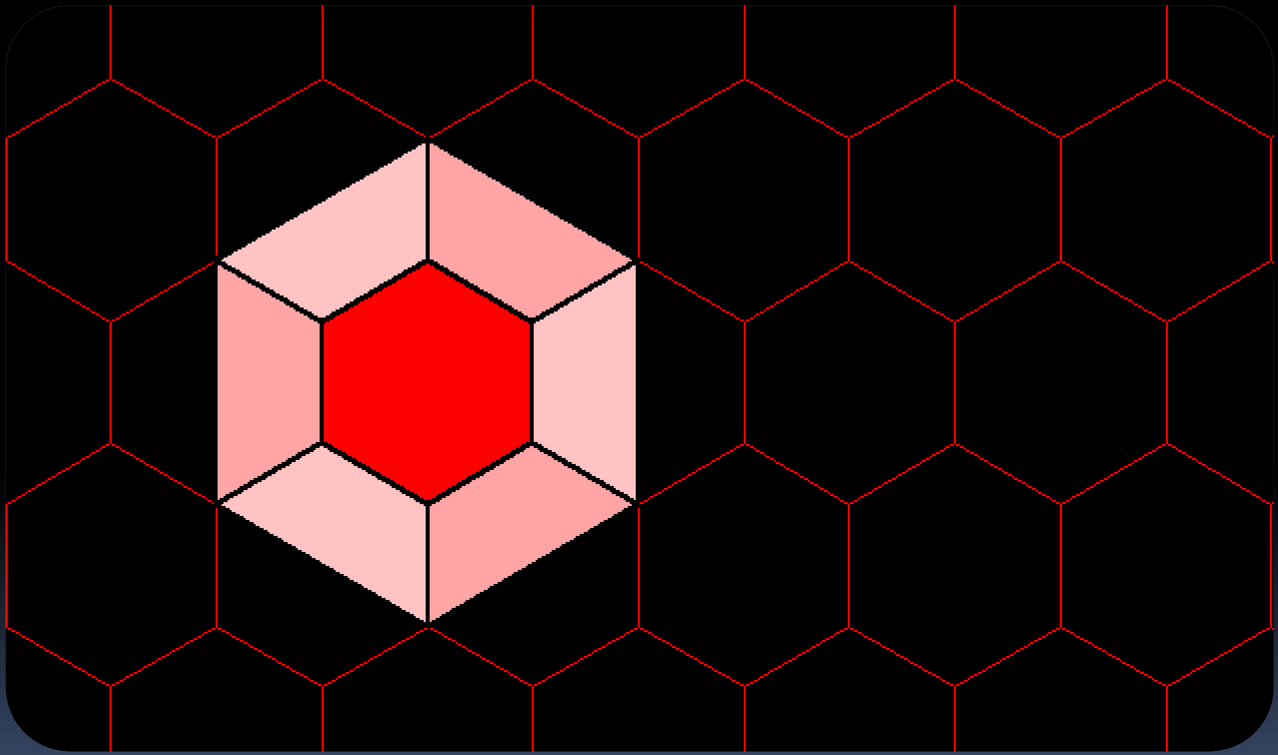
CONNECTION
TO THE NEXT SPEAKER…

ESRI's ArcMap database shows 126,166 features in the cemetery layer (gold) and 4303 features in the golf course layer (green).

The case of Michigan.



Cemeteries and Golf Courses:
Abstract Mixed Use Visualization



William E. Arlinghaus, B.A. President, Greenscape, Inc.

THE PERIMETER PROJECT:

GOLF COURSES AS 18 STATE “NATIONS”

The Perimeter Project: Phase 1.

Protect Fragile Lands using Cemetery Restrictions/Zoning

Pilot project: Chapel Hill Memorial Gardens, Grand Rapids. COMPLETE

Land acquisitions.

IN PROGRESS

Bundling of Archived Memorials Online with sale of cemetery plots, cremation service, etc.

Creation of Virtual Cemetery

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Extension of idea to include golf course perimeter lands—viewing the golf course as a nation of 18 contiguous states.

Memorialization:
Cemeteries and Golf Courses

When remains are integrated into the environment, rather than compactly stored in a vault or similar object, memorial needs may change…no longer are there marble monuments clearly and directly associated with individual remains.

The Internet offers direct, individual memorialization opportunity that becomes permanent when website maintenance is trust-funded as is traditional monument maintenance.

Kudos…and more…

Many Thanks to	Related Information

• The School of Natural Resources and Environment for room use;
• Kris Oswalt of Community Systems Foundation (CSF) for software support;
• Google Earth for a software donation to CSF;
• CSF archive http://www.csfnet.org
	• http://www.MyLovedOne.com
	• http://www.ArchivedMemorialsOnline.com
	• Articles in Solstice:
	  • June, 2009.
	  • December, 2009.
	  • June, 2010.
	  • December, 2010, forthcoming.