Spatial Synthesis
Volume II, Book 1:
Scientific, Planning, Humanitarian, and Teaching Applications, From DevInfo to Google Earth

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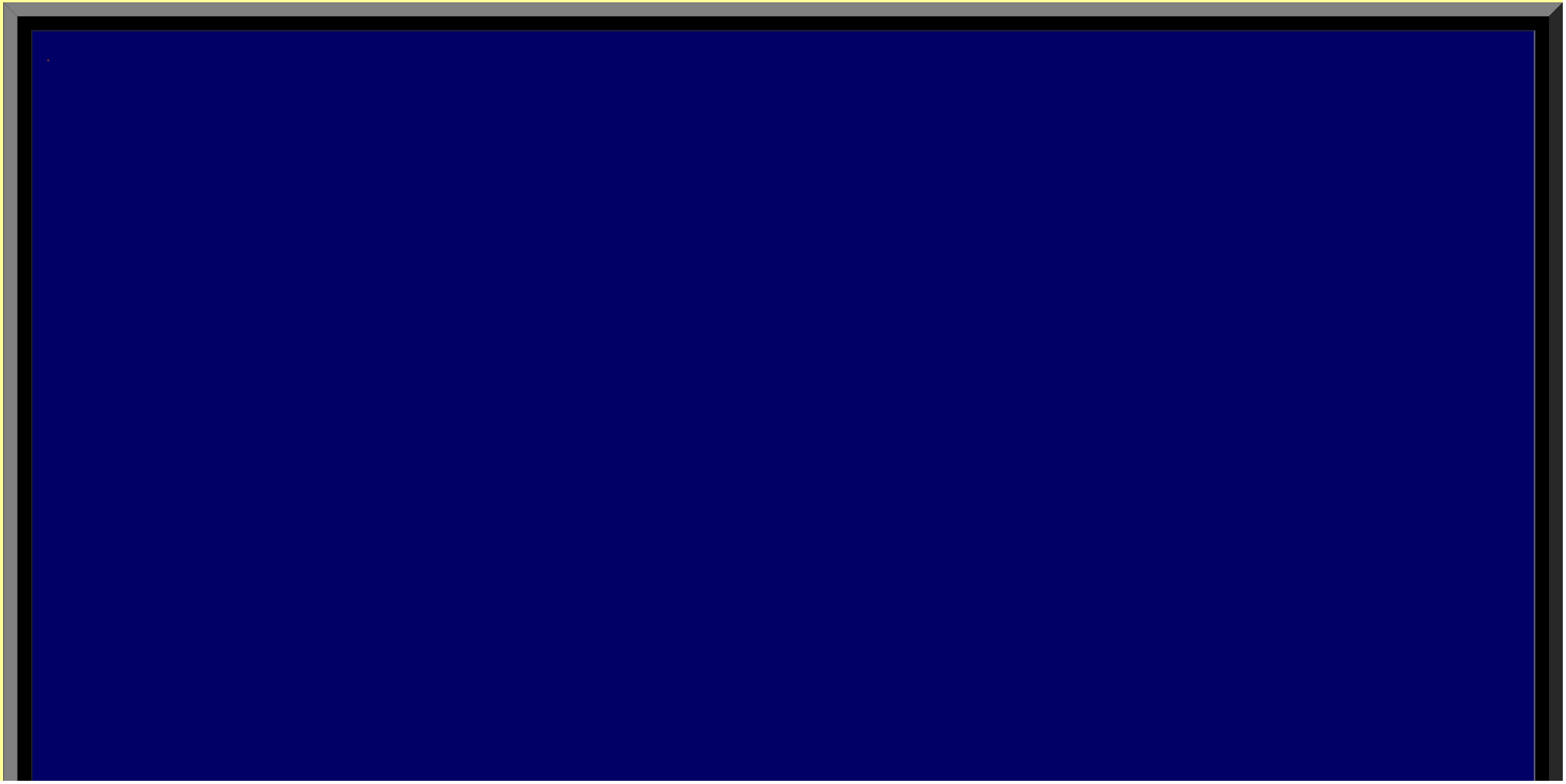
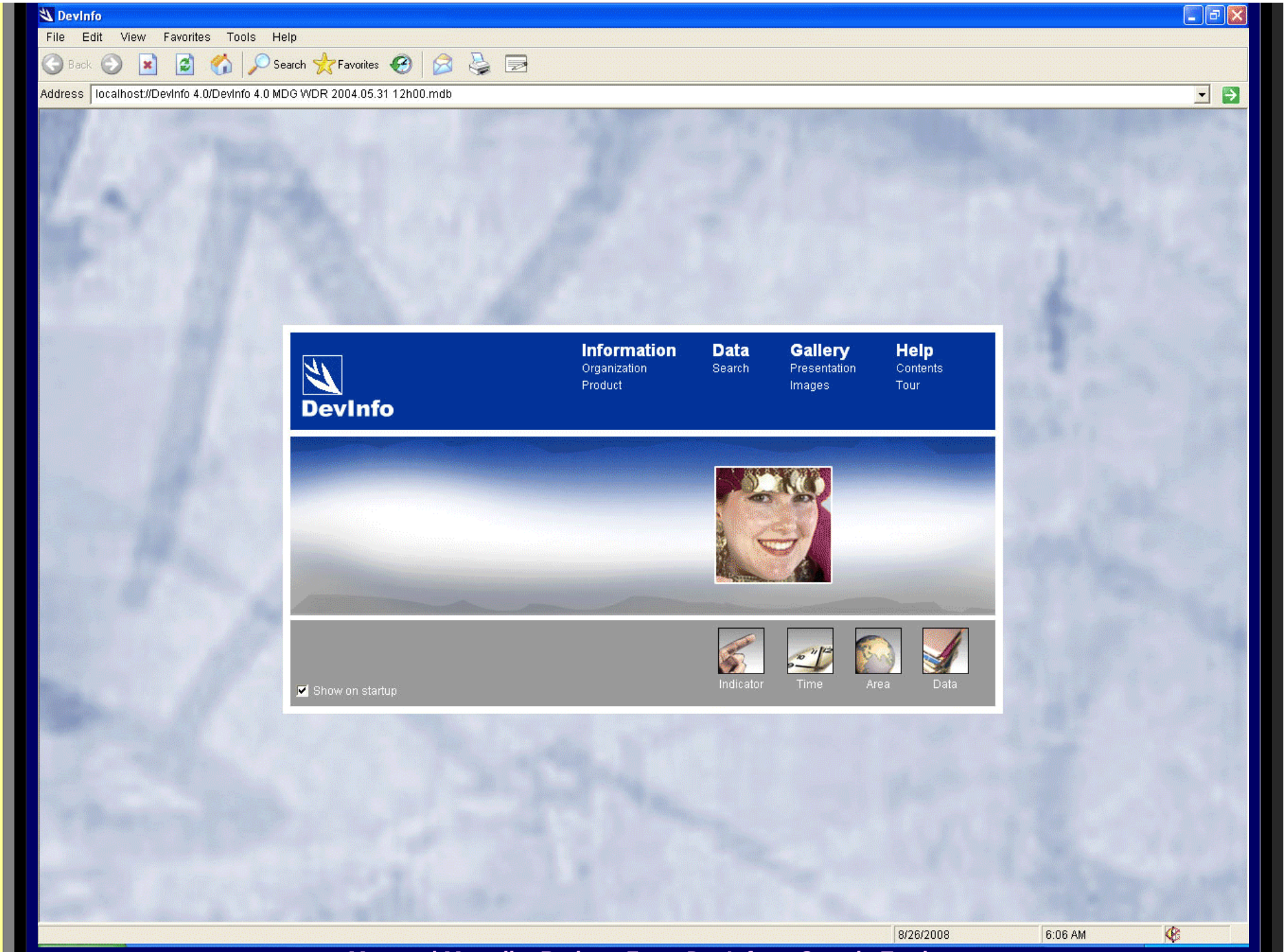
Matthew Naud, Kris S. Oswalt, Roger Rayle, Lars Schumann
and other contributions from:
William C. Arlinghaus, William E. Arlinghaus, Michael Batty, Robert Haug, Ann Larimore, Karl Longstreth, Gwen Nystuen, John D. Nystuen

Volume I of the *Spatial Synthesis series focuses on theory; Volume II of the series focuses on applications, turning theory into practice. This first book in Volume II gives readers a step-by-step guide on how to extract data from DevInfo software to use in GIS software (new and old) and in Google Earth. It also shows results of a variety of applications of 3D modeling in the scientific, planning, humanitarian, and teaching realms and suggests directions for future applications (most of which are already in progress).**





Maternal Mortality Ratios: From DevInfo to Google Earth.

*2005: Book. *Spatial Synthesis, Volume I: Centrality and Hierarchy. Book 1*. Arlinghaus, Sandra Lach and Arlinghaus, William Charles. June 21.

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- Google Earth®

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INTRODUCTION:

Assessment, Analysis, and Action--Community Systems Foundation Approach

Community Systems Foundation (CSF), an international NGO based in Ann Arbor (Michigan), has a long and rich history of implementing beneficial interventions in developing nations which are subsequently turned over to, and managed by, indigenous local groups. The hallmark of many of these is based on a three-pronged approach of "assessment, analysis, and action." A final stage involves "feedback" and a need to revisit and learn from the past. It is this CSF-inspired structure that is used in this second volume of *Spatial Synthesis*.

The principal author of this document has enjoyed the benefit of collaboration with Kris S. Oswalt and William D. Drake on a number of CSF projects that have employed this approach. In particular, she worked with both of them in the early stages of mapping development for the current CSF DevInfo software and on all stages of assessment, analysis, and action, on a project involving maternal and child healthcare in the Syrian Arab Republic. She also worked with Drake on a project involving the education of girls in the Punjab Province of Pakistan, again employing the CSF "triple-A" approach.

These two projects were completed in the mid-1990s. Now, with a decade of feedback and further development of software by Oswalt and team coupled with her own research in the use of contemporary mapping, and with others who offer contributions here, the cycle comes full-circle.

The material in this eBook guides the reader in a step-by-step visual approach from the CSF-developed software, DevInfo, into the 3D virtual reality world of Google Earth. Beyond the technical aspects, there are links to important applications made possible in today's virtual world that one could not easily even dream of only a few years ago. Included here is a selection of scientific, planning, humanitarian, and teaching applications using a range of software from DevInfo to Google Earth. Because the document is available in electronic-only format, rich use can be made at no cost of vibrant colors, animation, file download, and virtual reality.

The principal author thanks her many colleagues at CSF, particularly Kris S. Oswalt and the late William D. Drake. Their wisdom and guidance have been invaluable over many years. A debt of great gratitude is also owed to Rosina Bierbaum, Dean of the School of Natural Resources and Environment at The University of Michigan, as well as to SNRE colleagues Paul Mohai and Dan Brown. The 3D Laboratory at the Duderstadt Center of The University of Michigan, has offered great valuable advice and inspiration over many years. Klaus-Peter Beier, Director, and Lars Schumann, Manager, have been indispensible in helping in so many ways as have Steffen Heise, Eric Maslowski, and other staff in the 3D lab. A strong relationship continues there. She also thanks her collaborators on this project: Matthew Naud, who has been a continuing source of imaginative use of contemporary mapping capability in the municipal arena; Roger Rayle, who has seized upon and made brilliant use of 3D mapping in a local environmental project; and Lars Schumann, who has offered advice, support, and insight on 3D models over the years and who, here, shares his own clever "Magic Bus" project for tracking bus location in real-time on Google Earth. In addition, she thanks William C. Arlinghaus, William E. Arlinghaus, Michael Batty, Robert Haug, Ann E. Larimore, Karl Longstreth, Gwen Nystuen, and John D. Nystuen for their contributions noted within the text. Their sound advice, encouragement, enthusiasm, and intelligence, have stimulated much constructive activity over many years.

Applications of software in the municipal, international development, or other arenas are tricky at best. Software is always a moving target. Hardware almost never keeps pace with it. There is always more than one way to solve a problem; and, one never is sure who the target audience might be and what their capabilities or resource bases might be. Nonetheless, it is well worth the effort to communicate and to share knowledge and success through publication!

Great thanks go to two readers whose comments and reactions to a penultimate version of this document led to substantial improvements. With

electronic documents containing animation and virtual reality it is very helpful to watch the reaction of readers, in person. Two kind readers spent valuable time engaging in this activity. Others were sent, via e-mail, the penultimate version and offered the oppotunity to comment. With wonderful help such as this, one might hope that the document is free from errors...however, that seems quite unlikely and of course errors that remain in this work are the sole responsibility of the principal author.

Sources Consulted (precise URLs for numerous other references appear inline in the text)

- **Community Systems Foundation**
  - **Live**
  - **Archive**
- **DevInfo**
- **Institute of Mathematical Geography**
  - **Live**
  - **Archive**
- **2005: Book. *Spatial Synthesis, Volume I: Centrality and Hierarchy. Book 1*. Arlinghaus, Sandra Lach and Arlinghaus, William Charles. June 21.**
- **UNICEF: T*racking Progress in Maternal, Newborn & Child Survival.* Countdown to 2015. Preliminary Report. The United Nations Children's Fund, 2008.**
- **Continuing collaboration with MIke Batty; some of his (and his colleagues) urls:**
  - **http://www.casa.ucl.ac.uk/transportmodel/transportmodel.asp**
  - **http://www.digitalurban.blogspot.com/**

August, 2008
Ann Arbor, Michigan, USA

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ASSESSMENT

This chapter is split into sections arranged by continent (as defined in DevInfo). Within each continent, subsections are created according to software. Thus, one moves from the database in DevInfo, from which only indicators available for all countries are extracted, to GIS software, to Google Earth. The path through this maze of software interfaces is complex. It helps to keep the big picture in mind that the ultimate goal is 3D visualization of data sets. At each stage, there are files available to download. The ones that the reader needs to download, in order to read later sections of the book effectively, are the .kml files for Google Earth. Reference will be made later in this document to such files.

The strategy for moving from one software package to another is presented in great detail for Africa. For other continents, files are available for download and the reader should follow the steps in the process in the Africa section. Click on the linked continent names below (names as used in DevInfo) to see more.

AFRICA

DevInfo: there are 8 indicators available for all nations. The "raw .apr" files are the GIS files extracted from the underlying DevInfo database. These files may be opened directly in ArcView 3.2+ and may be imported into ArcMap 9.2+. The path of bringing them into ArcView 3.2+ and then into ArcMap 9.2+ produces results that are more reliable than simply importing them into ArcMap 9.x.

Indicators Available:

- Maternal mortality ratio, Deaths per 100,000 Live Births, Total
- Prevalence of underweight (moderate and Severe), Percent, Total <5yr.
- Primary completion rate, Rate, Total
- Proportion of 1 year-old children immunised against measles, percent, total 1yr
- Proportion of births attended by skilled helath personnel, Percent, Total
- Proportion of population with access to improved sanitation, Percent, Total
- Proportion of population with sustainable access to an improved water source, Percent, Total
- Under-five mortality rate, Deaths per 1000 live births, Total

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ArcView 3.2+: the raw .apr files generated above are opened in ArcView 3.2+ and the underlying database is edited in ways that will eventually create files that will work well in Google Earth. These new .apr files are referred to below as "edited .apr" files.

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ArcCatalog: the shape files in the edited .apr files need to be "projected" to make them display properly in ArcMap 9.2+. Download all four file formats for each map and put them in a single folder.

Projected Shape Files:

- Maternal mortality ratio: | dbf | prj | shp | shx |
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- Proportion of births attended by skilled health personnel, Percent, Total: | dbf | prj | shp | shx |
- Proportion of population with access to improved sanitation, Percent, Total: | dbf | prj | shp | shx |
- Proportion of population with sustainable access to an improved water source, Percent, Total: | dbf | prj | shp | shx |
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ArcMap 9.2+: the shape files are opened in ArcMap and a choropleth map is created from them. The results are saved in the native .mxd format (again, available for download). When

ArcMap has a plug-in added to it, these files can be converted to .kml files suitable for display in Google Earth. Download and install "export shape to KML" plug-in for ArcMap 9.2+.

- **Zipped file**
- **Link to external download page**

Set of Choropleth Maps from Shape Files:
All available indicators in a single file, mxd format

Raw .kml Files:

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- Proportion of births attended by skilled health personnel, Percent, Total: | dbf | prj | shp | shx |
- Proportion of population with access to improved sanitation, Percent, Total: | dbf | prj | shp | shx |
- Proportion of population with sustainable access to an improved water source, Percent, Total: | dbf | prj | shp | shx |
- Under-five mortality rate, Deaths per 1000 live births, Total: | dbf | prj | shp | shx |

ArcMap 9.2+: the shape files are opened in ArcMap and a choropleth map is created from them. The results are saved in the native .mxd format (again, available for download). When ArcMap has a plug-in added to it, these files can be converted to .kml files suitable for display in Google Earth. Download and install "export shape to KML" plug-in for ArcMap 9.2+.

- **Zipped file**
- **Link to external download page**

Set of Choropleth Maps from Shape Files:
All available indicators in a single file, mxd format

Raw .kml Files:

- Maternal mortality ratio, kml
- Prevalence of underweight (moderate and severe)--Percent, Total < 5 yr., kml
- Primary Completion Rate, Rate, Total, kml
- Proportion of 1 year-old children immunised against measles, Percent, Total 1 yr., kml
- Proportion of births attended by skilled health personnel, Percent, Total, kml
- Proportion of population with access to improved sanitation, Percent, Total, kml
- Proportion of population with sustainable access to an improved water source, Percent, Total, kml
- Under-five mortality rate, Deaths per 1000 live births, Total, kml

Google Earth: further editing of .kml files can take place in Google Earth.

Edited .kml Files: Suggestions are given in the files for Africa. There is a great deal of variation in how one might choose to edit these files depending on desired visual and

comparative outcomes.

NORTHERN AMERICA

DevInfo: there are 5 indicators available for all nations. The "raw .apr" files are the GIS files extracted from the underlying DevInfo database. These files may be opened directly in ArcView 3.2+ and may be imported into ArcMap 9.2+. The path of bringing them into ArcView 3.2+ and then into ArcMap 9.2+ produces results that are more reliable than simply importing them into ArcMap 9.2+.

Indicators Available:

- Maternal mortality ratio, Deaths per 100,000 Live Births, Total
- Proportion of 1 year-old children immunised against measles, percent, total 1yr
- Proportion of births attended by skilled helath personnel, Percent, Total
- Proportion of population with sustainable access to an improved water source, Percent, Total
- Under-five mortality rate, Deaths per 1000 live births, Total

Raw .apr Files:

- Maternal mortality ratio, Deaths per 100,000 Live Births, Total, raw .apr
- Proportion of 1 year-old children immunised against measles, percent, total 1yr, raw .apr
- Proportion of births attended by skilled helath personnel, Percent, Total, raw .apr
- Proportion of population with access to improved sanitation, Percent, Total, raw .apr
- Proportion of population with sustainable access to an improved water source, Percent, Total, raw .apr
- Under-five mortality rate, Deaths per 1000 live births, Total, raw .apr

ArcView 3.2+: the raw .apr files generated above are opened in ArcView 3.2+ and the underlying database is edited in ways that will eventually create files that will work well in Google Earth. These new .apr files are referred to below as "edited .apr" files.

Edited .apr Files:

- Maternal mortality ratio, Deaths per 100,000 Live Births, Total, edited .apr
- Proportion of 1 year-old children immunised against measles, percent, total 1yr, edited .apr
- Proportion of births attended by skilled helath personnel, Percent, Total, edited .apr
- Proportion of population with access to improved sanitation, Percent, Total, edited .apr
- Proportion of population with sustainable access to an improved water source, Percent, Total, edited .apr
- Under-five mortality rate, Deaths per 1000 live births, Total, edited .apr

ArcCatalog: the shape files in the edited .apr files need to be "projected" to make them

display properly in ArcMap 9.2+. Download all four file formats for each map and put them in a single folder.

Projected Shape Files:

- Maternal mortality ratio: | dbf | prj | shp | shx |
- Proportion of 1 year-old children immunised against measles, Percent, Total 1 yr.: | dbf | prj | shp | shx |
- Proportion of births attended by skilled health personnel, Percent, Total: | dbf | prj | shp | shx |
- Proportion of population with access to improved sanitation, Percent, Total: | dbf | prj | shp | shx |
- Proportion of population with sustainable access to an improved water source, Percent, Total: | dbf | prj | shp | shx |
- Under-five mortality rate, Deaths per 1000 live births, Total: | dbf | prj | shp | shx |

ArcMap 9.2+: the shape files are opened in ArcMap and a choropleth map is created from them. The results are saved in the native .mxd format (again, available for download). When ArcMap has a plug-in added to it, these files can be converted to .kml files suitable for display in Google Earth. Download and install "export shape to KML" plug-in for ArcMap 9.2+.

- **Zipped file**
- **Link to external download page**

Set of Choropleth Maps from Shape Files:
All available indicators in a single file, mxd format
In some cases, using "Natural Breaks" for data classification yielded fewer than 8 classes. In those cases, the maximum number available was used.

Raw .kml Files:

- Maternal mortality ratio, Deaths per 100,000 Live Births, Total, kml
- Proportion of 1 year-old children immunised against measles, percent, total 1yr, kml
- Proportion of births attended by skilled helath personnel, Percent, Total, kml
- Proportion of population with access to improved sanitation, Percent, Total, kml
- Proportion of population with sustainable access to an improved water source, Percent, Total, kml
- Under-five mortality rate, Deaths per 1000 live births, Total, kml

Google Earth: further editing of .kml files can take place in Google Earth.

Edited .kml Files: Suggestions are given in the files for Africa. There is a great deal of variation in how one might choose to edit these files depending on desired visual and comparative outcomes.

OCEANIA

DevInfo: there are 7 indicators available for all nations. The "raw .apr" files are the GIS files extracted from the underlying DevInfo database. These files may be opened directly in ArcView 3.2+ and may be imported into ArcMap 9.2+. The path of bringing them into ArcView 3.2+ and then into ArcMap 9.2+ produces results that are more reliable than simply importing them into ArcMap 9.2+.

Indicators Available:

- Maternal mortality ratio, Deaths per 100,000 Live Births, Total
- Primary completion rate, Rate, Total
- Proportion of 1 year-old children immunised against measles, percent, total 1yr
- Proportion of births attended by skilled helath personnel, Percent, Total
- Proportion of population with access to improved sanitation, Percent, Total
- Proportion of population with sustainable access to an improved water source, Percent, Total
- Under-five mortality rate, Deaths per 1000 live births, Total

Raw .apr Files:

- Maternal mortality ratio, Deaths per 100,000 Live Births, Total, raw .apr
- Primary completion rate, Rate, Total, raw .apr
- Proportion of 1 year-old children immunised against measles, percent, total 1yr, raw .apr
- Proportion of births attended by skilled helath personnel, Percent, Total, raw .apr
- Proportion of population with access to improved sanitation, Percent, Total, raw .apr
- Proportion of population with sustainable access to an improved water source, Percent, Total, raw .apr
- Under-five mortality rate, Deaths per 1000 live births, Total, raw .apr

ArcView 3.2+: the raw .apr files generated above are opened in ArcView 3.2+ and the underlying database is edited in ways that will eventually create files that will work well in Google Earth. These new .apr files are referred to below as "edited .apr" files.

Edited .apr Files:

- Maternal mortality ratio, edited .apr
- Primary Completion Rate, Rate, Total, edited .apr
- Proportion of 1 year-old children immunised against measles, Percent, Total 1 yr., edited .apr
- Proportion of births attended by skilled health personnel, Percent, Total, edited .apr
- Proportion of population with access to improved sanitation, Percent, Total, edited .apr
- Proportion of population with sustainable access to an improved water source, Percent, Total, edited .apr
- Under-five mortality rate, Deaths per 1000 live births, Total, edited .apr

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Projected Shape Files:

- Maternal mortality ratio: | dbf | prj | shp | shx |
- Primary Completion Rate, Rate, Total: | dbf | prj | shp | shx |
- Proportion of 1 year-old children immunised against measles, Percent, Total 1 yr.: | dbf | prj | shp | shx |
- Proportion of births attended by skilled health personnel, Percent, Total: | dbf | prj | shp | shx |
- Proportion of population with access to improved sanitation, Percent, Total: | dbf | prj | shp | shx |
- Proportion of population with sustainable access to an improved water source, Percent, Total: | dbf | prj | shp | shx |
- Under-five mortality rate, Deaths per 1000 live births, Total: | dbf | prj | shp | shx |

ArcMap 9.2+: the shape files are opened in ArcMap and a choropleth map is created from them. The results are saved in the native .mxd format (again, available for download). When ArcMap has a plug-in added to it, these files can be converted to .kml files suitable for display in Google Earth. Download and install "export shape to KML" plug-in for ArcMap 9.2+.

- **Zipped file**
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Set of Choropleth Maps from Shape Files:
All available indicators in a single file, mxd format
In some cases, using "Natural Breaks" for data classification yielded fewer than 8 classes. In those cases, the maximum number available was used.

Raw .kml Files:

- Maternal mortality ratio, kml
- Primary Completion Rate, Rate, Total, kml
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- Proportion of births attended by skilled health personnel, Percent, Total, kml
- Proportion of population with access to improved sanitation, Percent, Total, kml
- Proportion of population with sustainable access to an improved water source, Percent, Total, kml
- Under-five mortality rate, Deaths per 1000 live births, Total, kml

Google Earth: further editing of .kml files can take place in Google Earth.

Edited .kml Files: Suggestions are given in the files for Africa. There is a great deal of variation in how one might choose to edit these files depending on desired visual and comparative outcomes.

Technical notes:

- Files in .apr format can be imported directly into ArcMap (rather than first going through the ArcView step). However, there may be some resulting loss of information. For additional information see:

  http://support.esri.com/index.cfm?fa=knowledgebase.techarticles.articleShow&d=17424

- Readers without current GIS software, or with older GIS software, can find a number of free downloads on the internet that will convert shapefiles to .kml files. Some conversion packages are plug-ins for GIS software and some are stand-alone packages that do not require GIS software. Many work well; some are more stable than others. Search using terms such as: "shape to kml convert"

- Google Earth free download is very nice. Typically, though, Google Earth Pro (not free) has higher resolution photographs making detailed visualization clearer.

TABLE OF CONTENTS

Software used in analysis:

- DevInfo 5.0: http://www.devinfo.org/
- Adobe® PhotoShop and ImageReady
- Adobe® DreamWeaver
- ESRI:
  - ArcView® 3.2
  - ArcGIS® 9.2
    - ArcCatalog®
    - ArcMap®
- Google Earth®

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http://www.imagenet.org
http://deepblue.lib.umich.edu/handle/2027.42/58219
August, 2008.

Spatial Synthesis
Volume II, Book 1:
Scientific, Planning, Humanitarian, and Teaching Applications, From DevInfo to Google Earth

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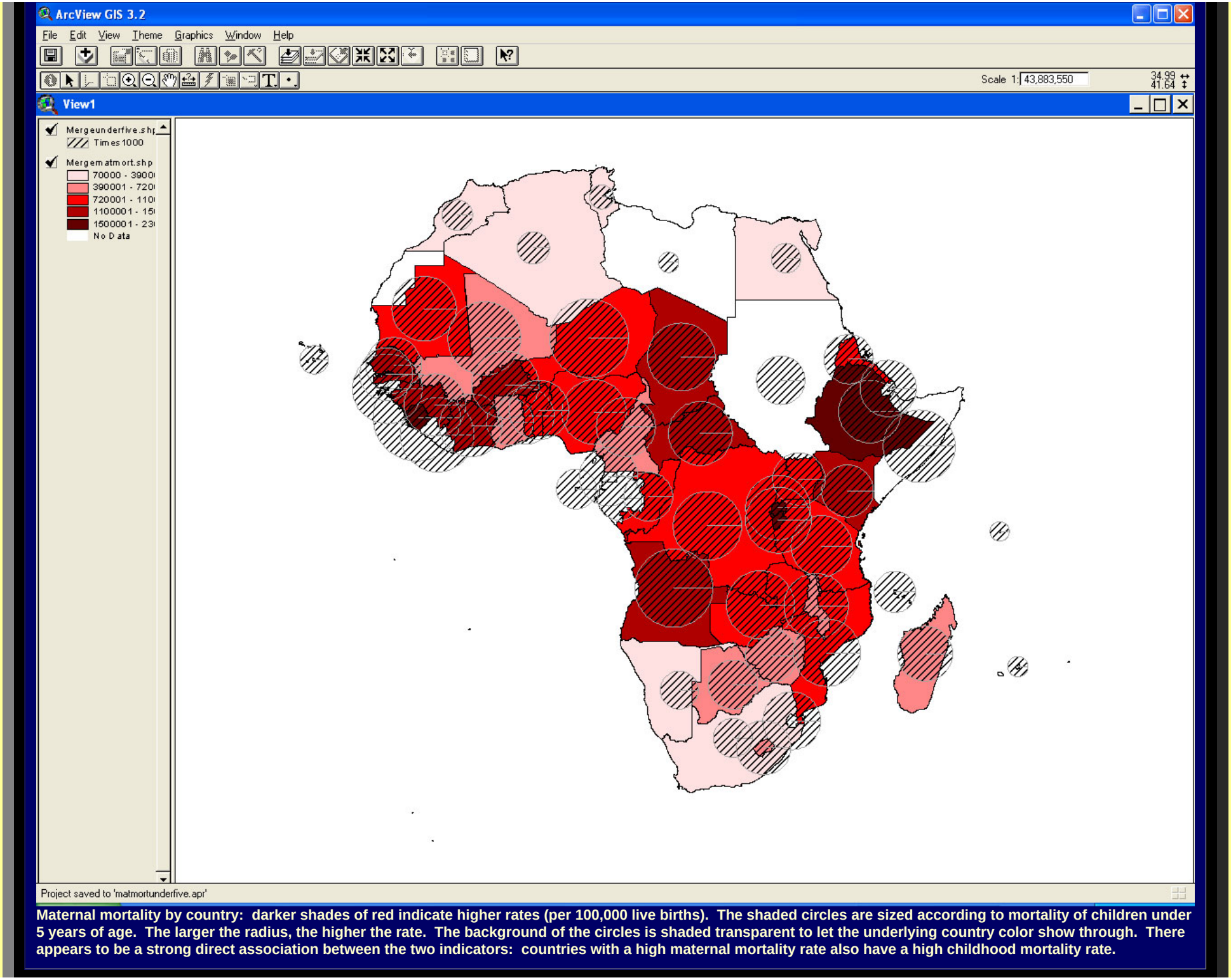
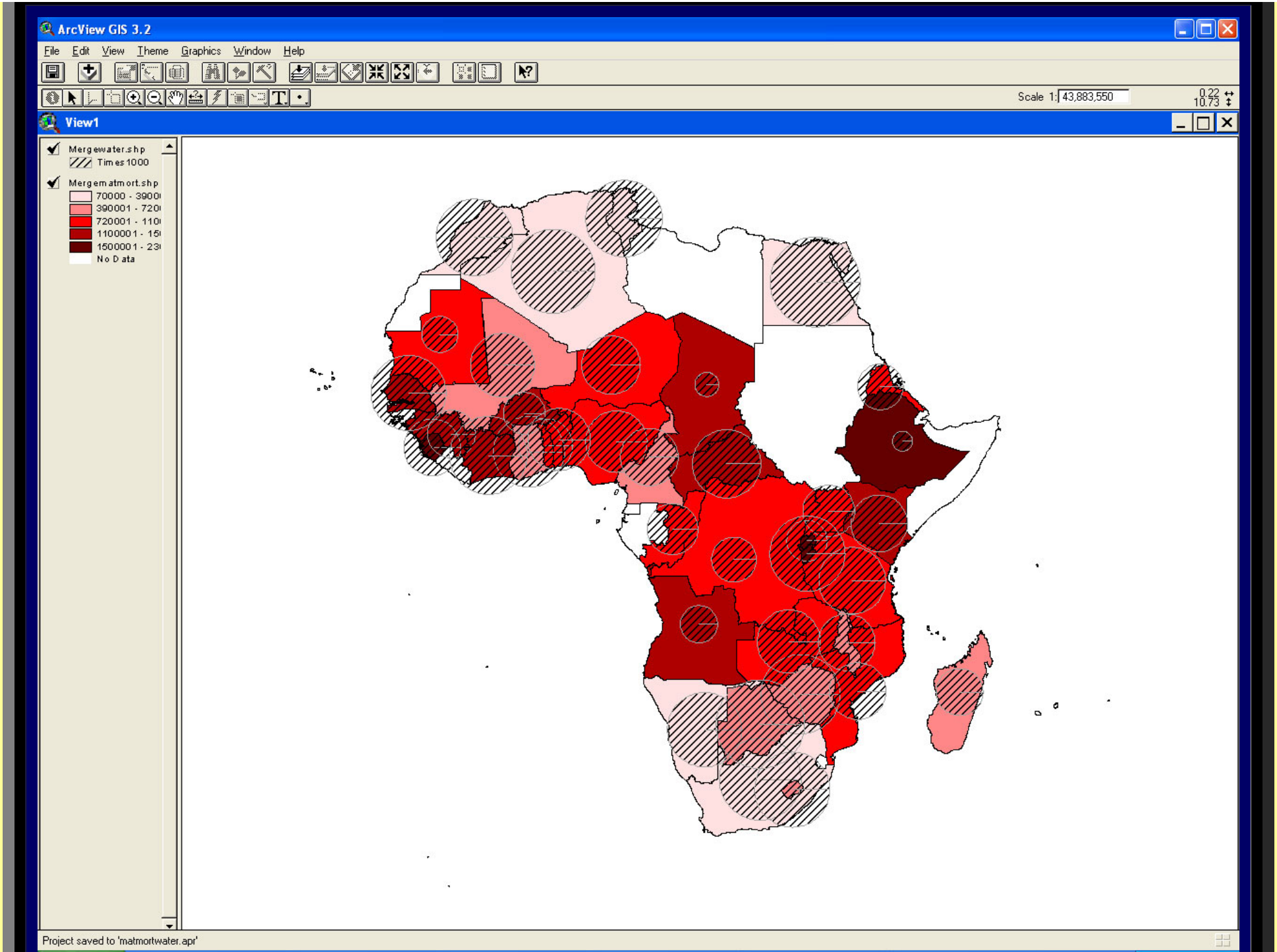
ANALYSIS

- **GIS Analysis: a variety of strategies may be employed here. In the previous chapter, the .apr file was converted directly in ArcView3.2; it may also be imported into ArcMap. In either case, one has to be careful to include needed fields in the underlying attribute table required for projection of data to Google Earth. Similarly, analysis at the level of the GIS interface may take place either in ArcView 3.x or in ArcMap 9.x. Some samples of each are offered below as some groups may have access only to the older software. They are merely suggestive of the vast array that might be created. The indicators chosen are suggested by the UNICEF working document: *Tracking Progress in Maternal, New Born & Child Survival, The 2008 Report*.**
    - **ArcView 3.x**



Maternal mortality by country: darker shades of red indicate higher rates (per 100,000 live births). The shaded circles are sized according to mortality of children under 5 years of age. The larger the radius, the higher the rate. The background of the circles is shaded transparent to let the underlying country color show through. There appears to be a strong direct association between the two indicators: countries with a high maternal mortality rate also have a high childhood mortality rate.



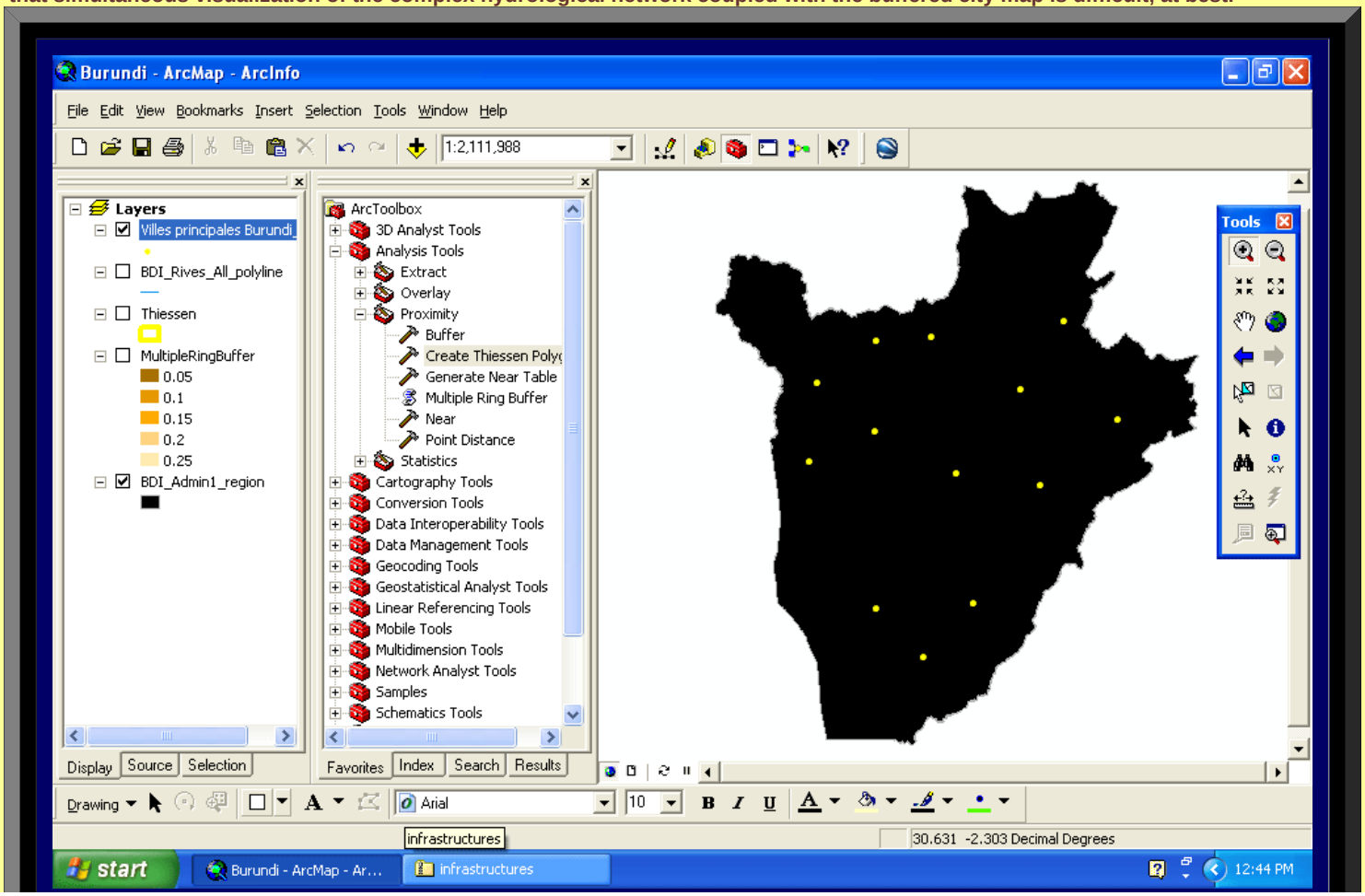
Maternal mortality by country: darker shades of red indicate higher rates (per 100,000 live births). The shaded circles are sized according to sustained access to fresh water. The larger the radius, the higher the value. The background of the circles is shaded transparent to let the underlying country color show through. There appears to be a strong inverse association between the two indicators: countries with a low maternal mortality rate have a high value for sustained access to water.

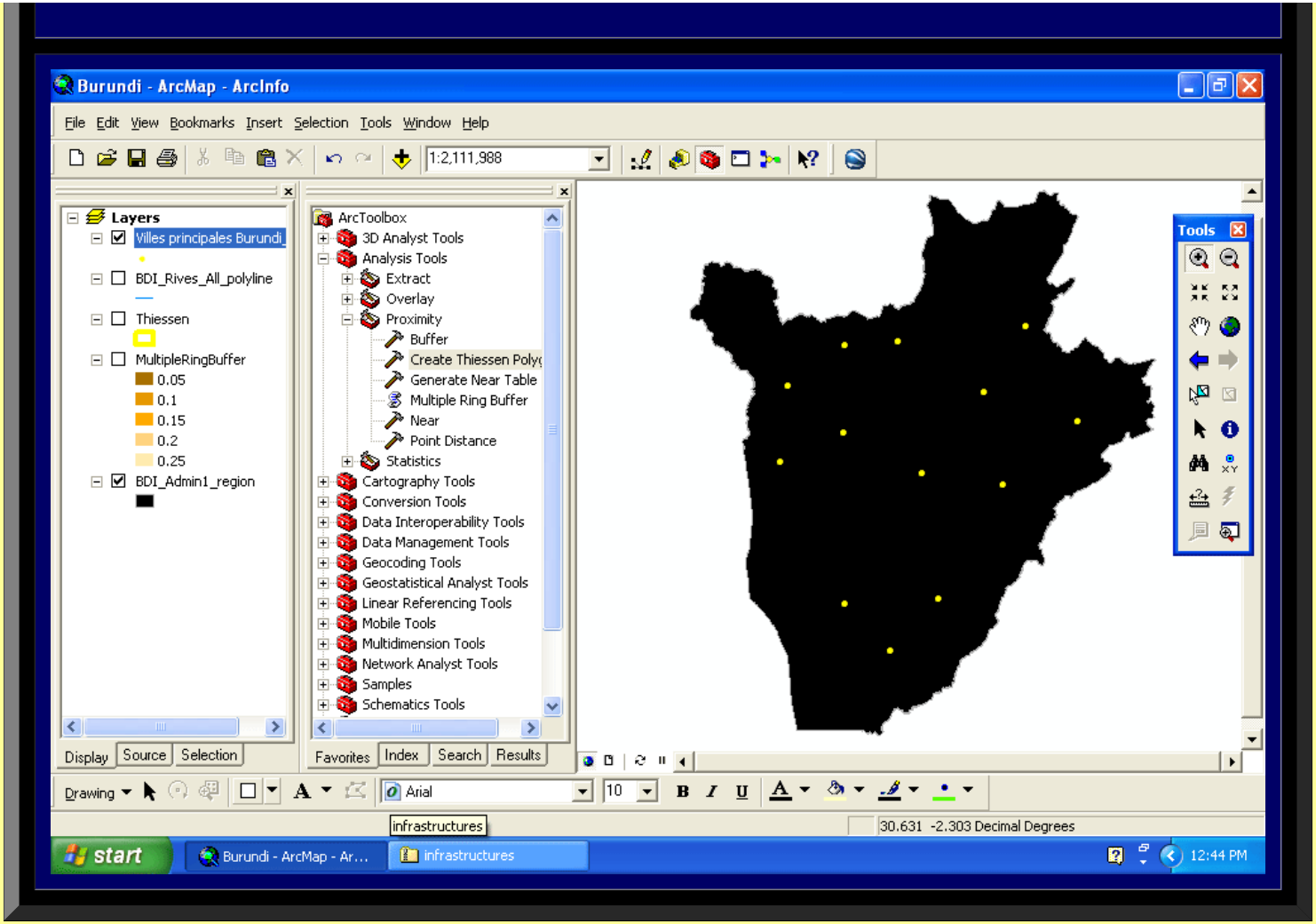
Perhaps these observed associations are not surprising. It seems plausible to think that countries that have high mortality for one fragile group might well have high mortality for others. On the other hand, it also seems plausible that good access to fresh water may help to reduce mortality and vice-versa. Maps of this sort, are useful for demonstrating natural associations to a target population that might be otherwise unaware of them. They are often of even greater value, however, when one looks for the areas that do NOT conform to the expected situation. In this case, the coastal countries of west Africa and Burundi appear to have high maternal mortality ratios, high childhood mortality rates, and fairly high values of sustained access to fresh water. Taking a closer look at public health policy and a variety of other variables, normalizing as appropriate, that focus on these areas might be suggested. The map serves not only as a visual display of data but also as a guide to where further research and data collection might be targeted: maps and decisions interact and affect each other.

- **ArcMap 9.x**

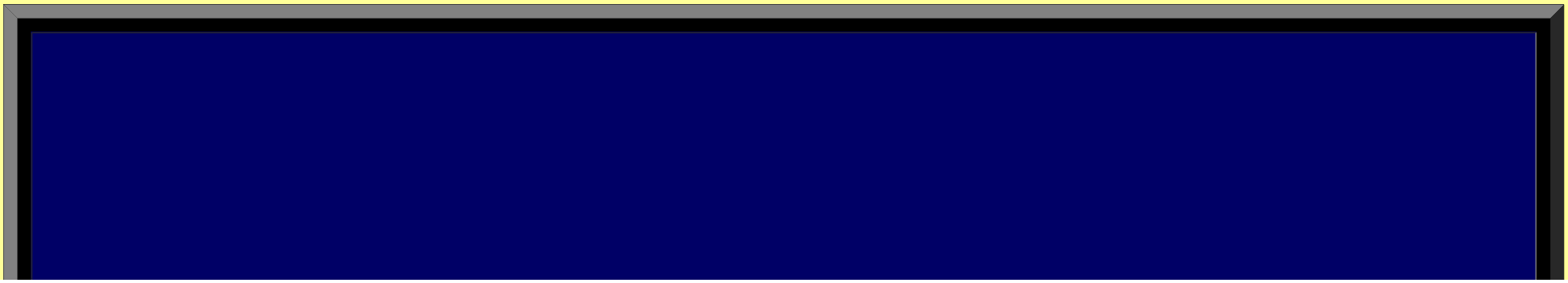
One of the great improvements in the current GIS package from ESRI is the presence of ArcCatalog which allows projection of the data. It is easy to do and the online help is fine support. The associated mapping package, ArcMap 9.x, permits extensive analysis of data, in a fairly straightforward fashion. Each of ArcView 3.x and ArcMap 9.x has its merits and drawbacks. Some users may be forced, through budgetary constraints, to remain with ArcView 3.x; others with extensive script libraries may choose to remain with ArcView 3.x. Most, however, will probably choose to obtain the latest software.

The example below singles out the country of Burundi for a closer look using ArcMap 9.x. The map incorporates a number of concepts: distance from a city; how cities share space; access to streams. The images below suggest one use of the ArcToolBox in ArcMap 9.x. Lines of the Thiessen polygons follow the intersections of the circular buffers surrounding the towns--that observation is a universal fact and is *not* coincidental (see, for example, the linked article with animated figures). While these maps have some uses, it is quite clear that simultaneous visualization of the complex hydrological network coupled with the buffered city map is difficult, at best.





However, when the city buffers and the hydrology are taken to Google Earth, and the transparency is set at various levels, it becomes easy to visualize, simultaneously, the buffers, the hydrology, and the features, such as roads, introduced in the checkboxes in Google Earth. The rivers follow the terrain and the buffers are centered on the cities; one can see buildings by diving into the buffers once they have been made transparent. The animations below illustrate screen captures of such activity in Google Earth. The reader is, however, encouraged to download the associated .kml files using these links and open the files in Google Earth: hydrology; buffers.



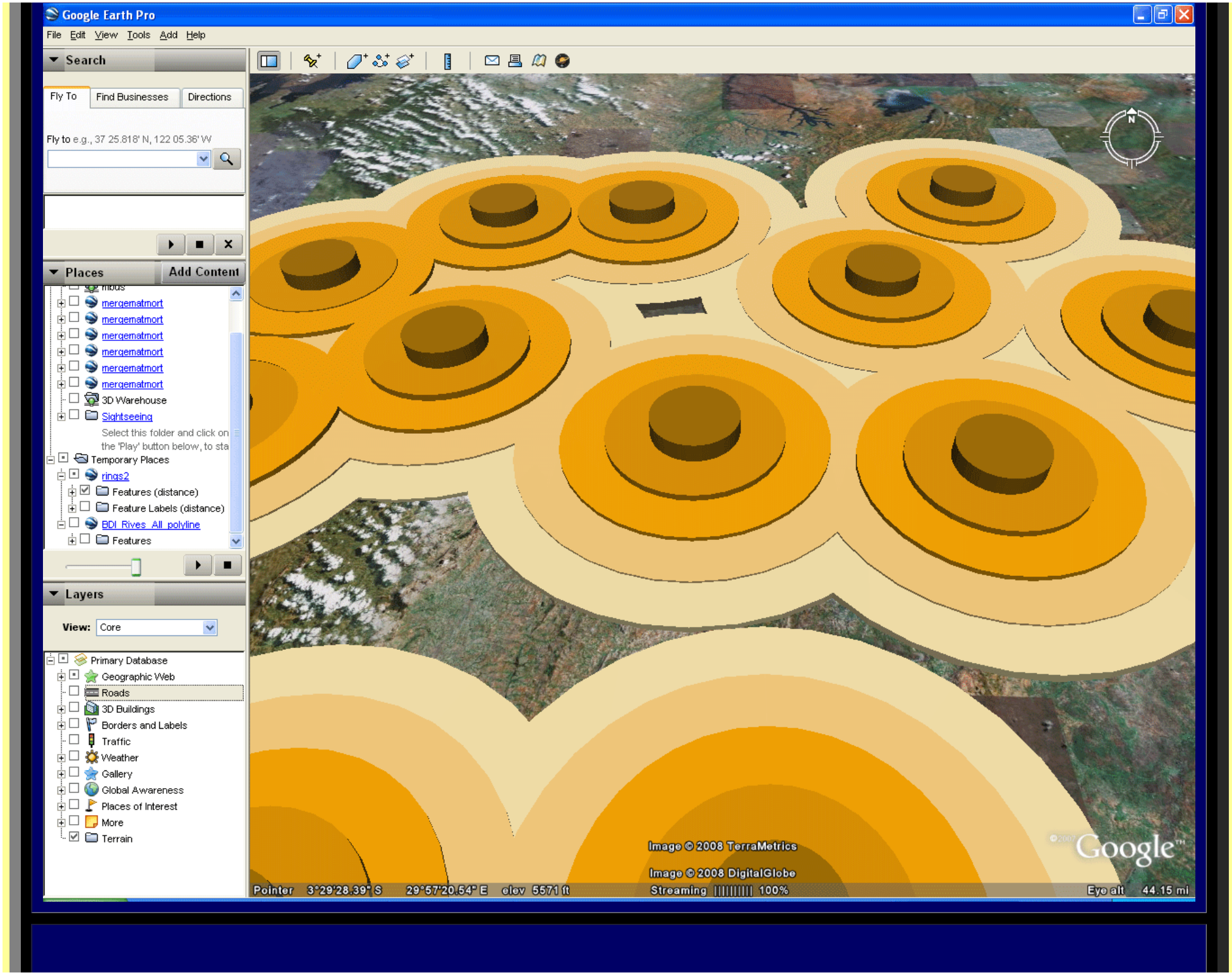

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Image © 2008 DigitalGlobe
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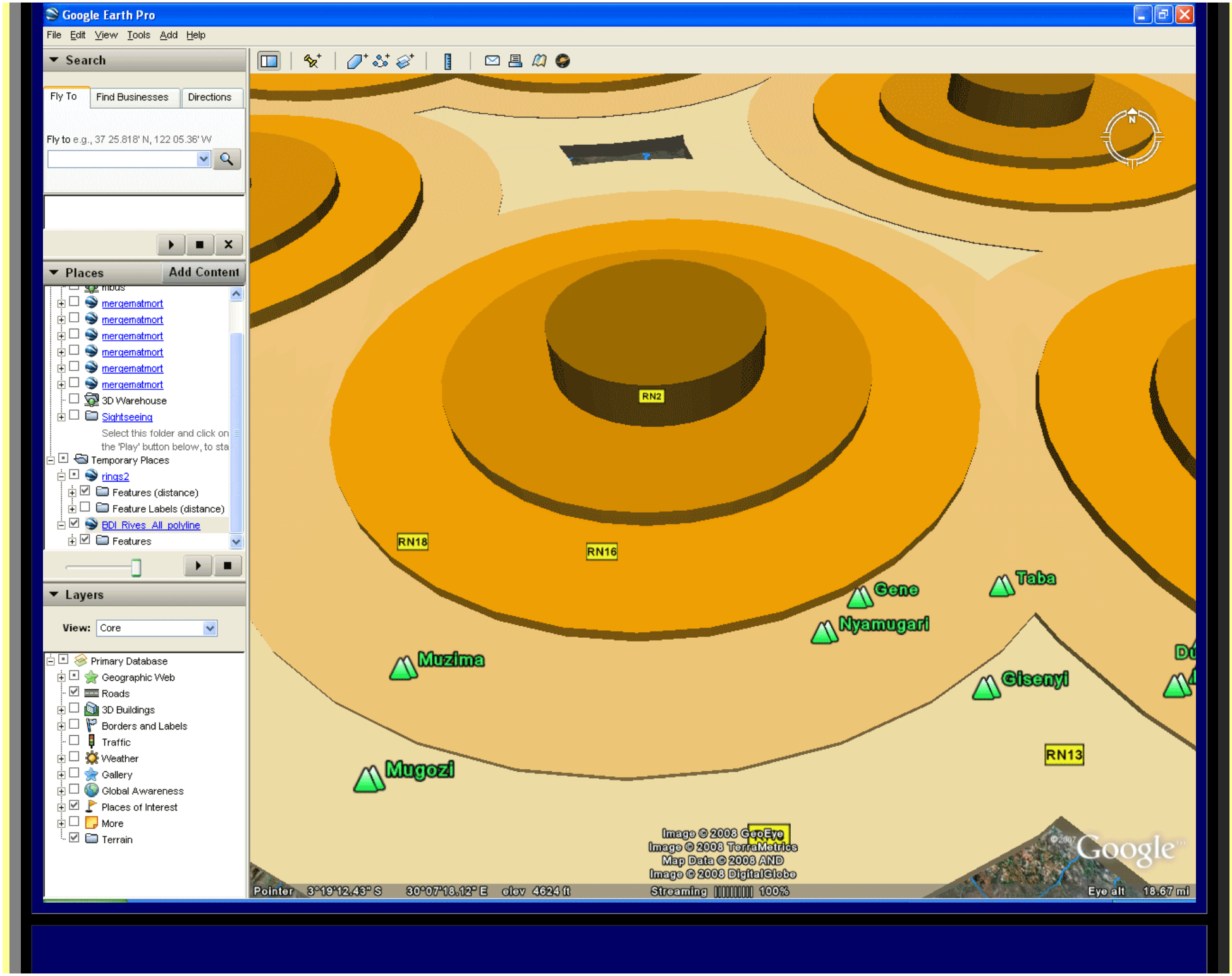
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Image © 2008 TerraMetrics
Map Data © 2008 AND
Image © 2008 DigitalGlobe
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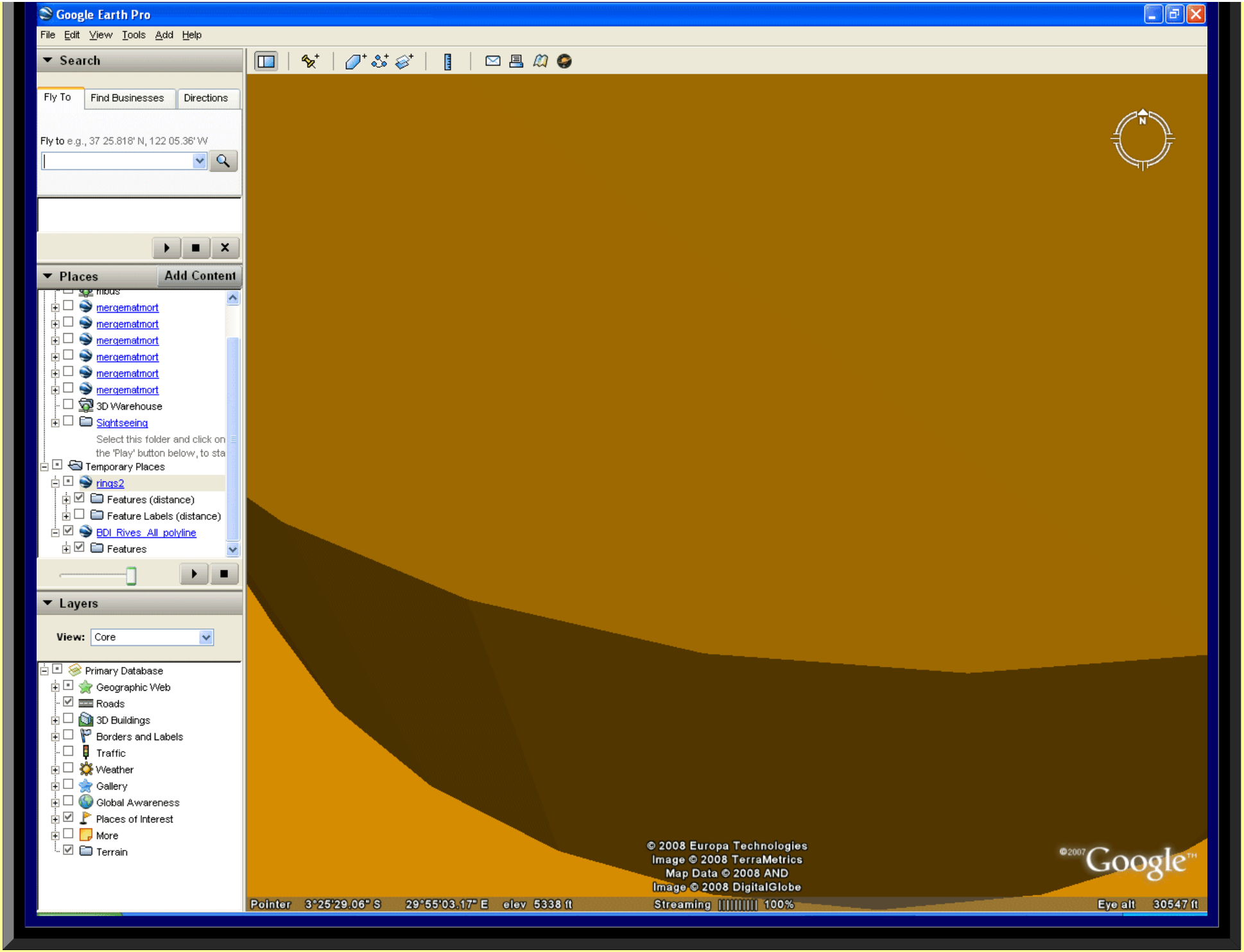
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Traffic
Weather
Gallery
Global Awareness
Places of Interest
More
Terrain
© 2008 Europa Technologies
Image © 2008 TerraMetrics
Map Data © 2008 AND
Image © 2008 DigitalGlobe
©2007 Google
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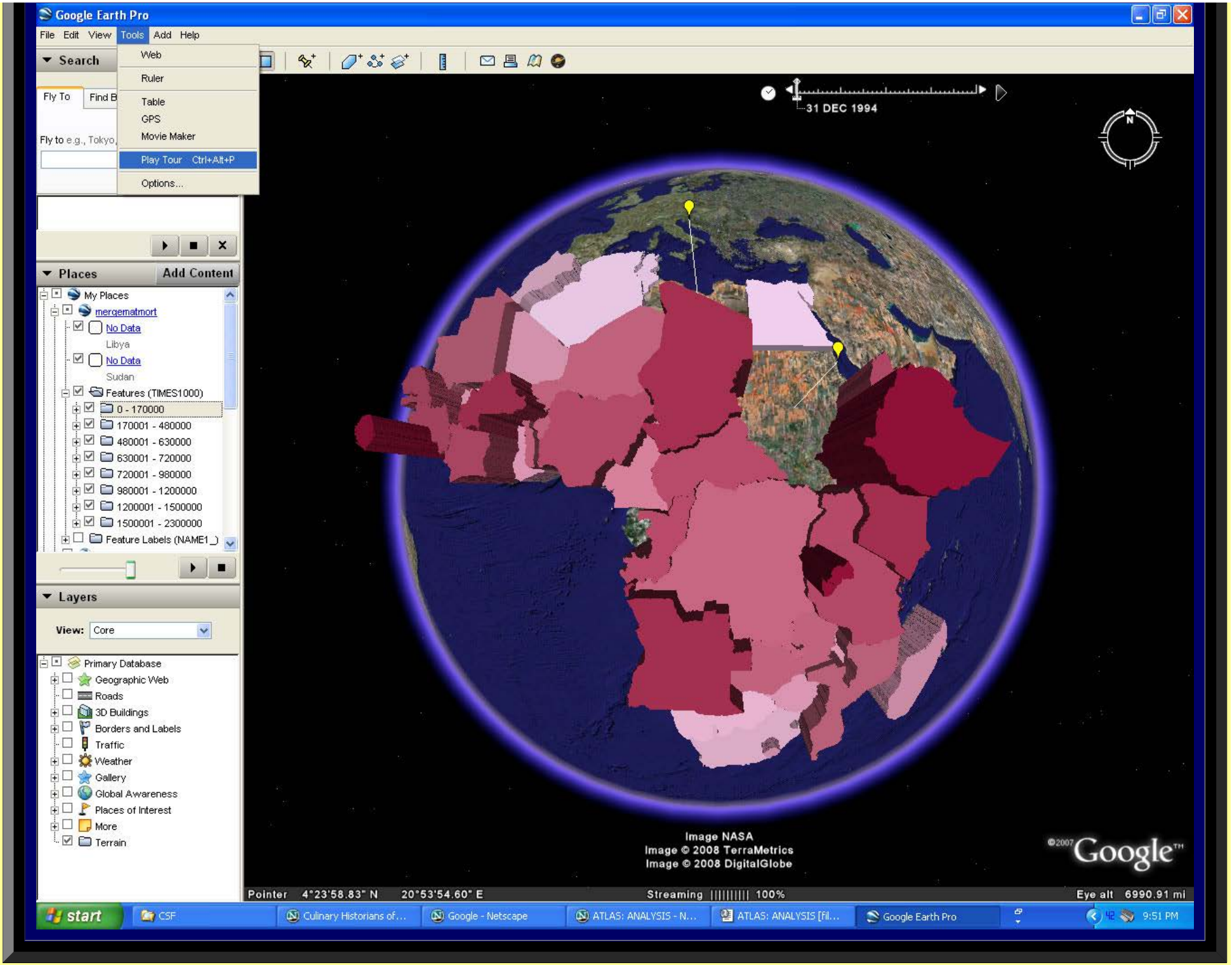
The world of GIS usage in spatial analysis is a complex one. There are many online resources available for the reader wishing to pursue various topics. The point here is simply to indicate that this richness is part of the sequence in moving from DevInfo to Google Earth and that it can be tapped in a variety of ways depending on available software and expertise.

- **Google Earth Analysis. Again, the indicators chosen are suggested by the UNICEF working document: *Tracking Progress in Maternal, New Born & Child Survival, The 2008 Report*. GIS software offers a stunning array of opportunity for analyzing spatial information. When the mapped information is transformed to Google Earth, the visualization come to life and offers the reader a chance to drive through mapped information. As with the GIS, there are many possible ways to visualize spatial data. A few are offered here to encourage the reader to make independent and imaginative trials, as well.**
    - **Placemarks and Animated Tours--use the associated .kml file downloaded from the previous chapter: One of the simplest ways to navigate a 3D scene is to let the software fly you around it. Add some "placemarks" to help with the navigation. In the scene below, two yellow balloon placemarks have been added to indicate that there is "no data" for either the Sudan or Libya. Then, going to "Tools" and "Play Tour" will lead the reader through the file for Maternal Mortality Ratios, country by country. The tour in this case is quite long; you will visit each of the islands in the various large offshore island groupings.**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Add Content
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170001 - 480000
480001 - 630000
630001 - 720000
720001 - 980000
980001 - 1200000
1200001 - 1500000
1500001 - 2300000
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Layers
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Primary Database
Geographic Web
Roads
3D Buildings
Borders and Labels
Traffic
Weather
Gallery
Global Awareness
Places of Interest
More
Terrain
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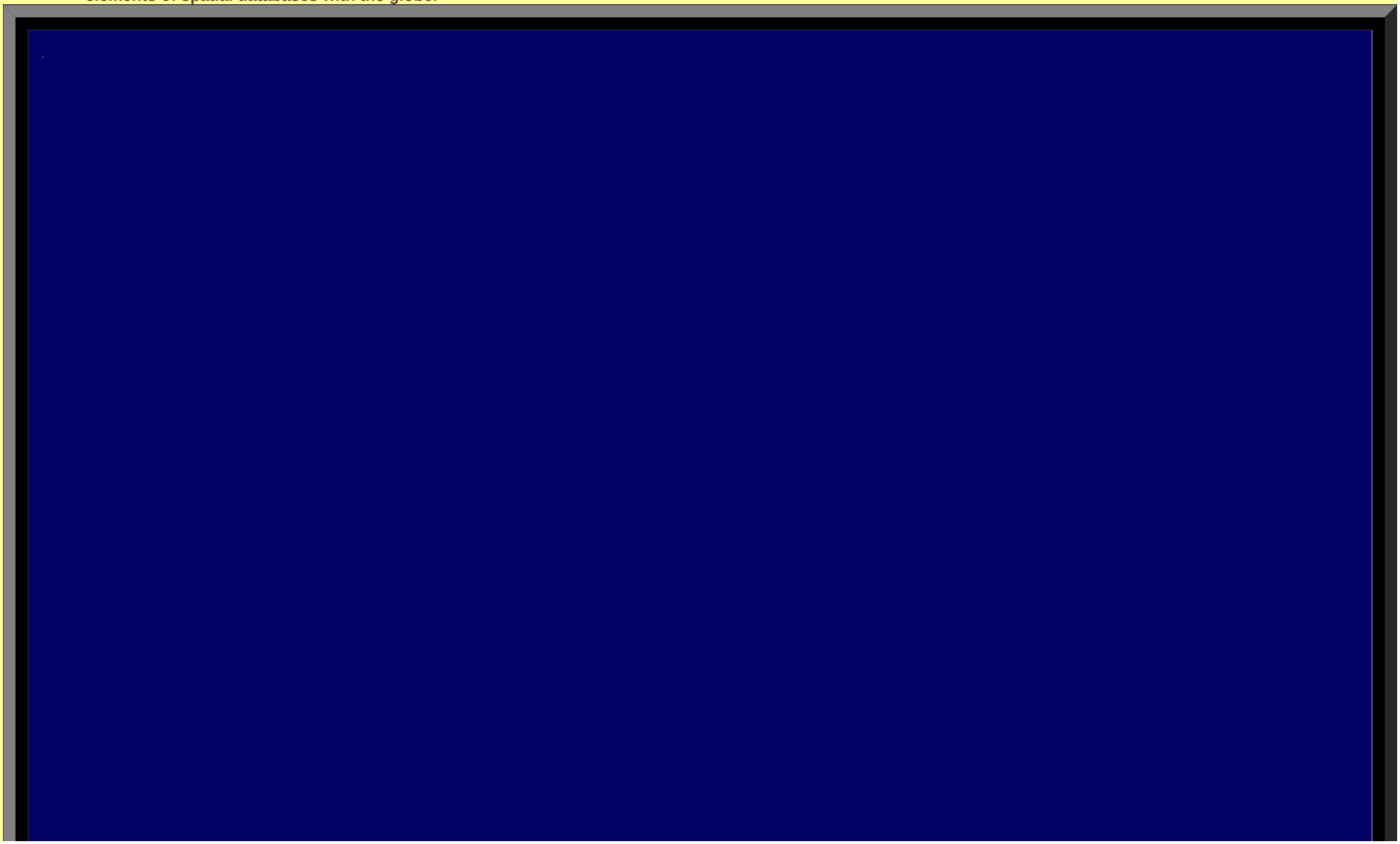
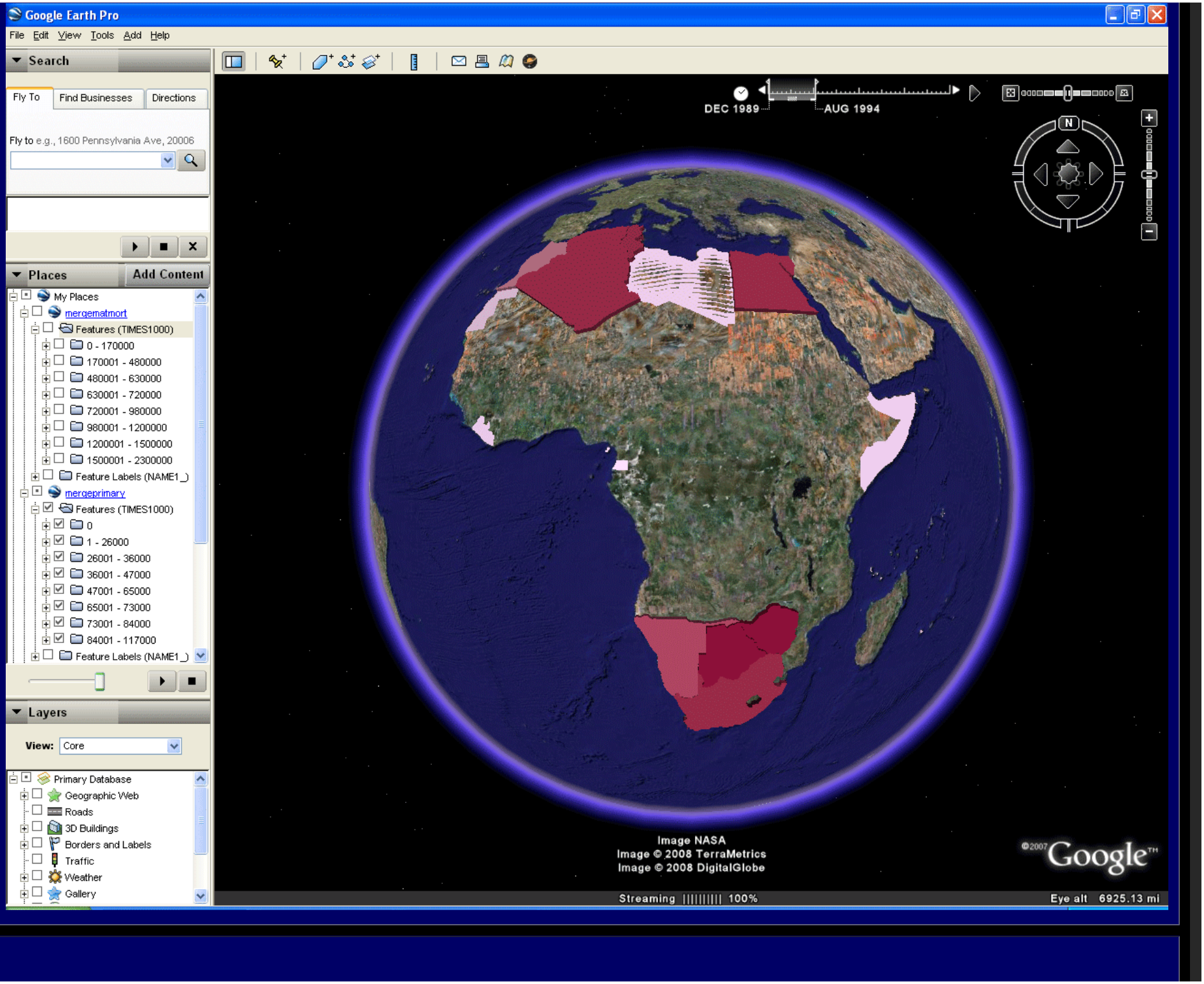
- **Automated Timelines:**
  - **Notice the timeline at the top right. In Google Earth, clicking on the arrow at the right end will create a display using the temporal data associated with each spatial file (entered in the Plug-in in ArcMap). In the animation of that timeline, in the top frame below, keep your eye on the timeline. You will see that as early as 1989 there is data for the Primary Completion indicator. There is none for the Maternal Mortality indicator until 1995. As the time moves forward on the timeline new countries come into the animation for the Primary Completion indicator. Then, a second indicator, Maternal Mortality, is switched on in 1995. Both indicators remain in the display until 2008 when the animation begins all over again.**
  - **However, it is difficult to distinguish one indicator from the other as the animation plays out. That is because the polygons in the Maternal Mortality indicator have much larger values than do those in the Primary Completion indicator. In the bottom figure in the pair below, the animation is stopped to freeze the time when the second indicator enters the picture. Then, it is a simple matter to alternate back and forth between the two indicators, using the check boxes on the left, so that the reader has a visual display of the apparent inverse relationship between Maternal Mortality and Primary Completion--Algeria, for example, is low within the Maternal Mortality indicator and high within the Primary Completion indicator.**

This sort of display offers yet another way to visualize different layers; it adds the component of time. Thus, the timeline feature offers a powerful way to link temporal elements of spatial databases with the globe.




Google Earth Pro
File Edit View Tools Add Help
Search
Fly To
Find Businesses
Directions
Fly to e.g., 1600 Pennsylvania Ave, 20006
Places
Add Content
My Places
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Features (TIMES1000)
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480001 - 630000
630001 - 720000
720001 - 980000
980001 - 1200000
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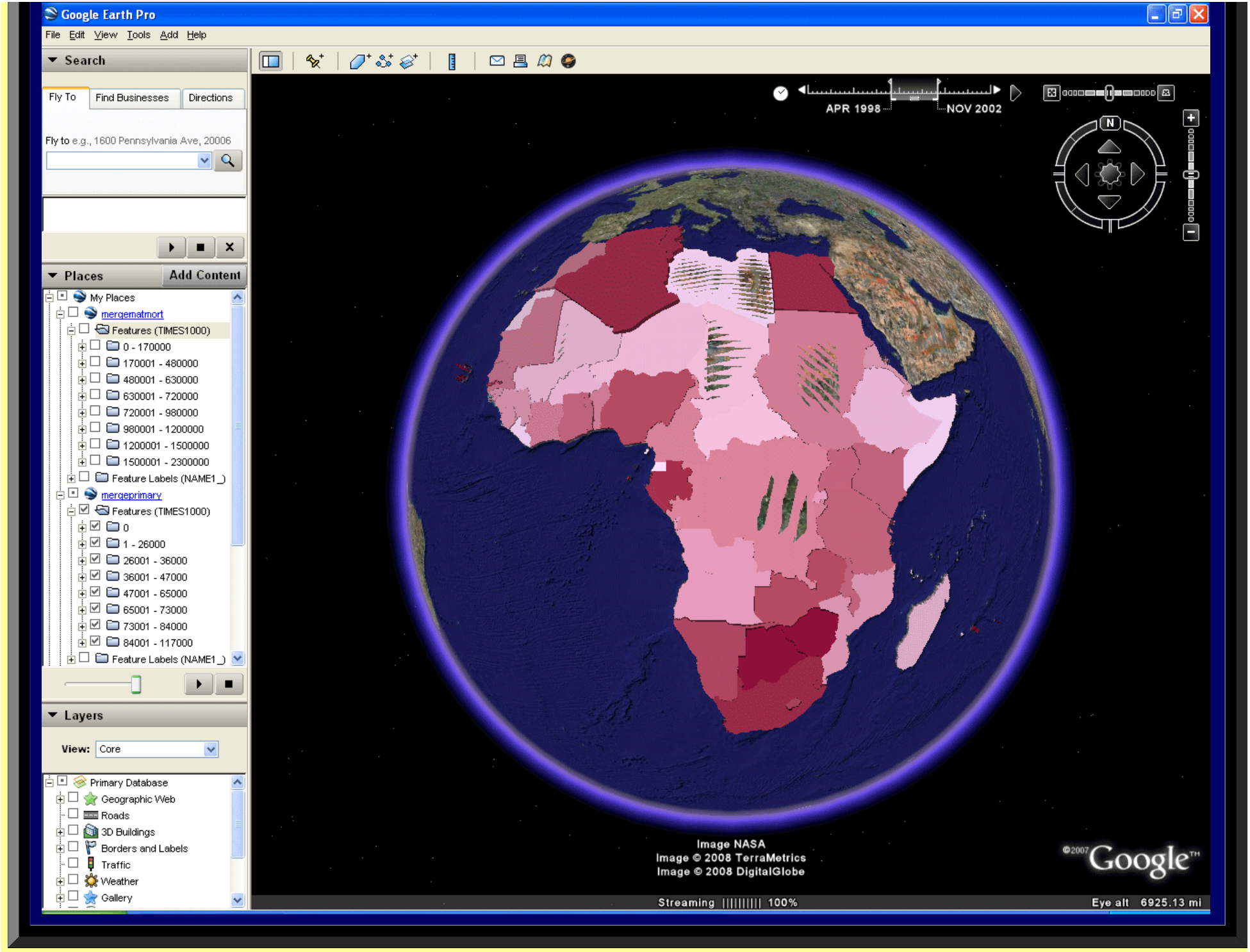
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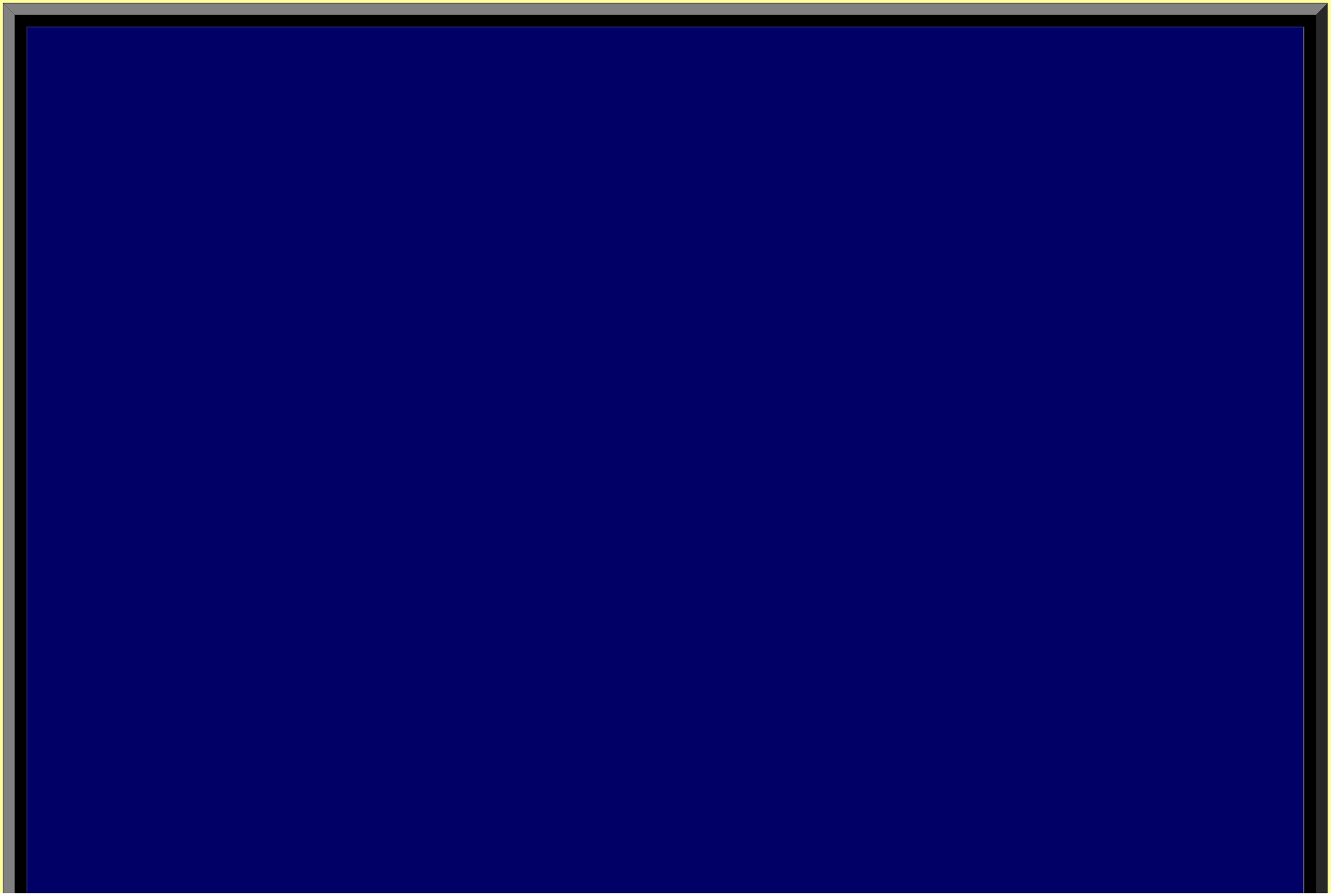
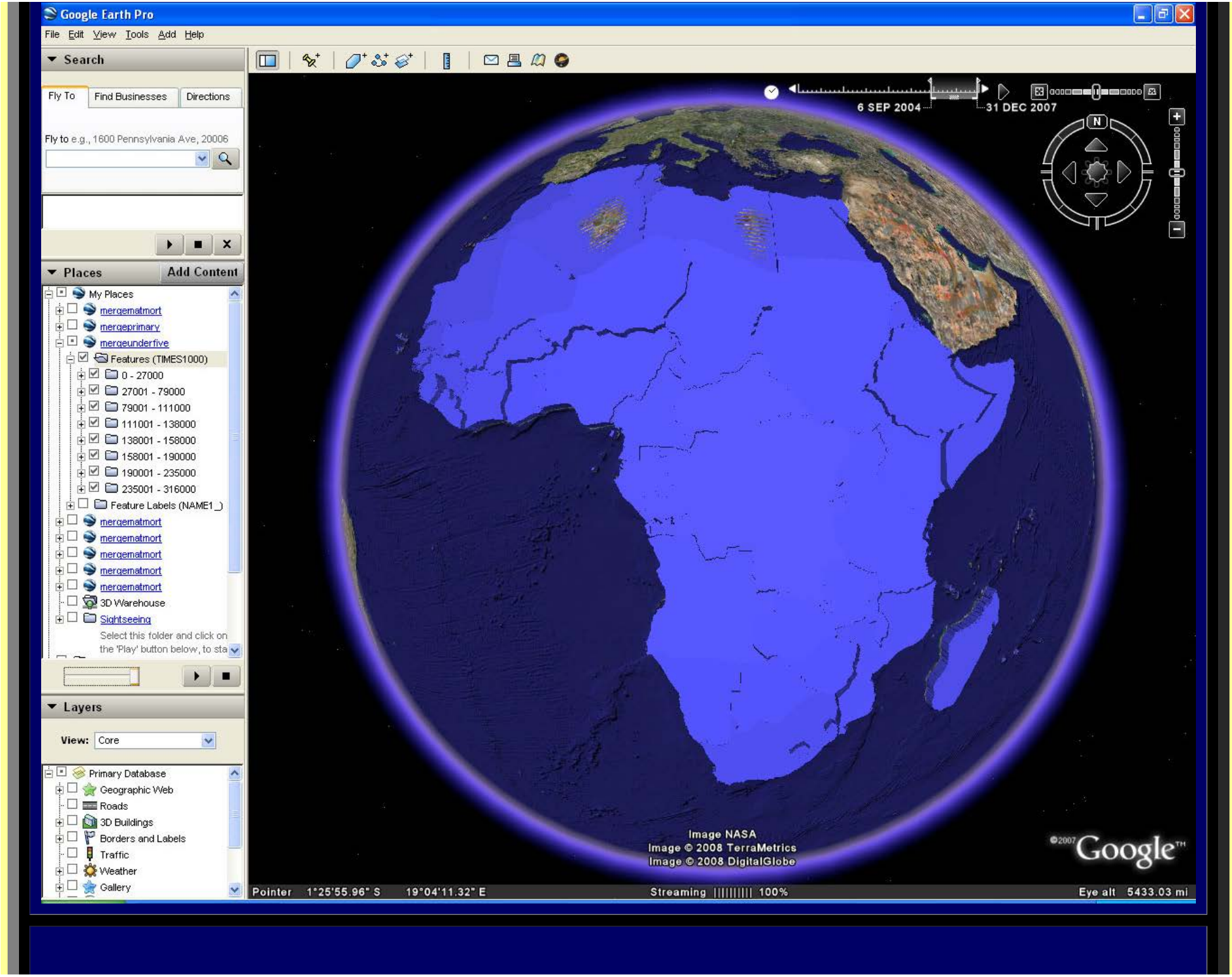
- **Custom Color Overlays: other ways to visualize multiple layers of data. Now consider two layers with polygons roughly the same height (Primary Completion and Childhood Mortality under Five Years of Age). The color intensity gradation in the images above, for any single layer, tells one story. The height of the extruded country polygons, for that same layer, also tells the same story. To make color and opacity changes, right-click on a layer name and choose "Properties" from the menu that comes up. Experiment with the various settings. Some suggestions are given below.**
  - **Under Five Indicator. One way to separate layers is to color each layer a single color (top frame below)--blue in this case. The height of the polygons within a layer gives information about the individual countries even though all polygons are the same color. Tip the display on its side to get a better view (second frame below). Zoom in to see more clearly. Take a better look at the coastal nations of West Africa.**

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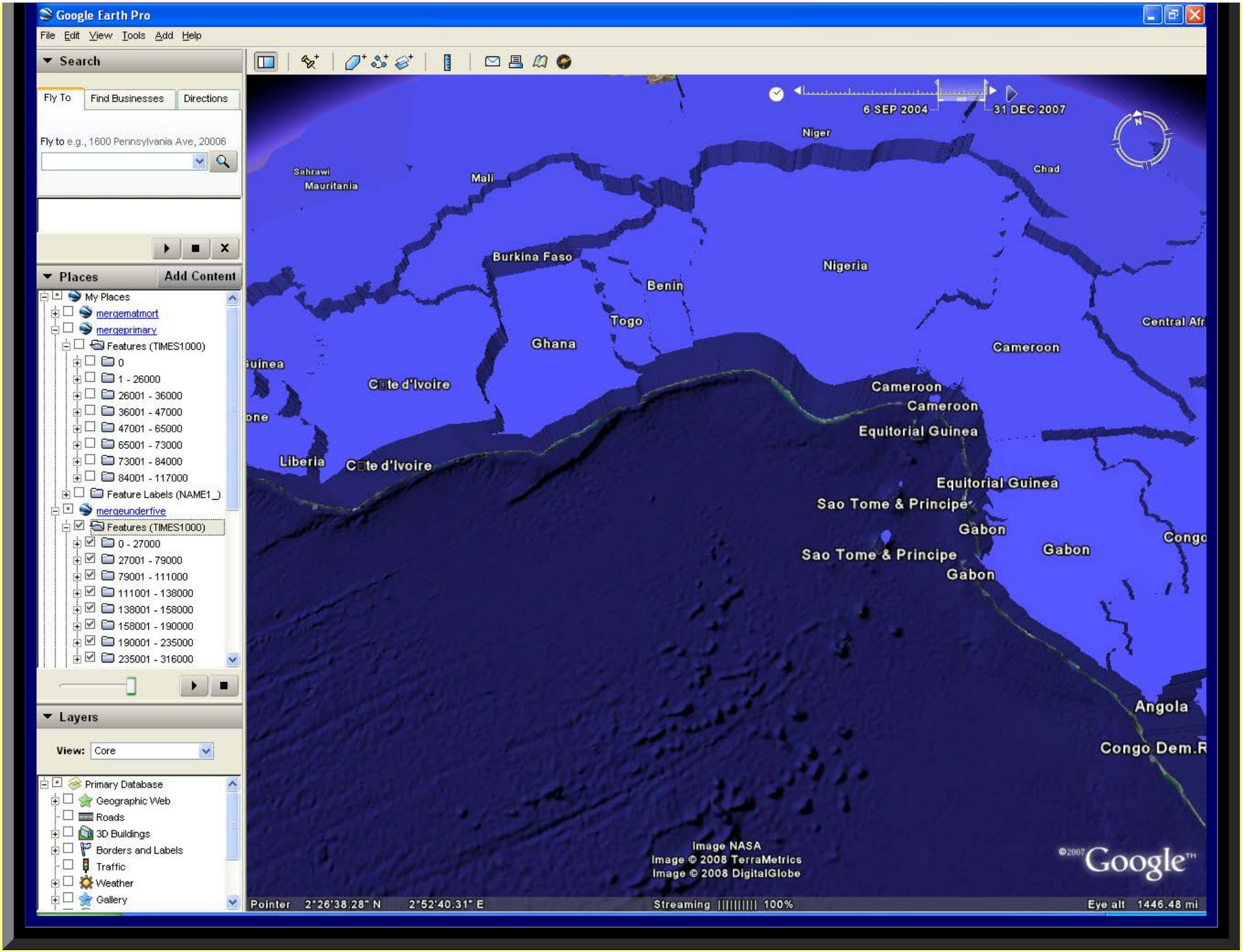
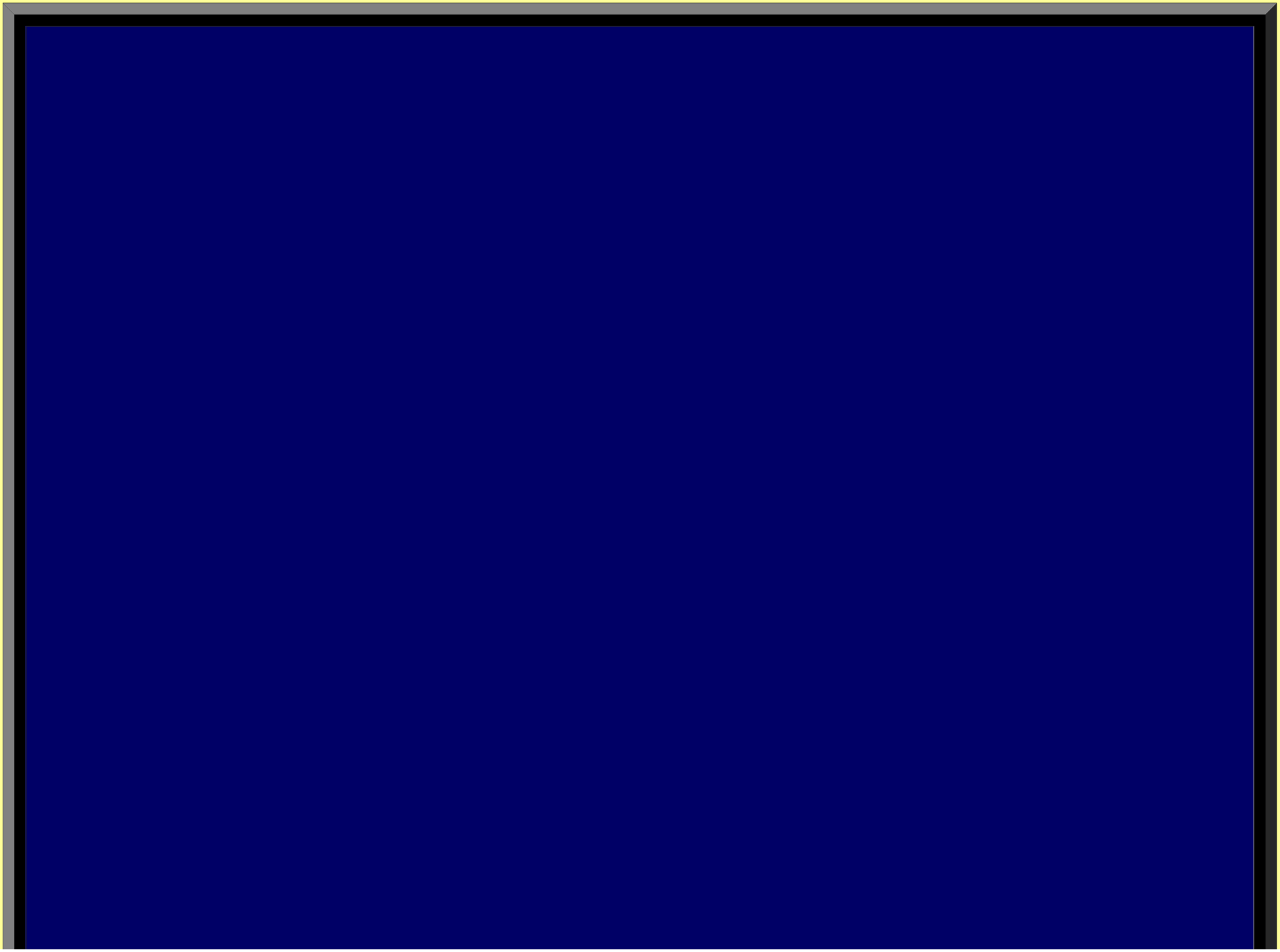
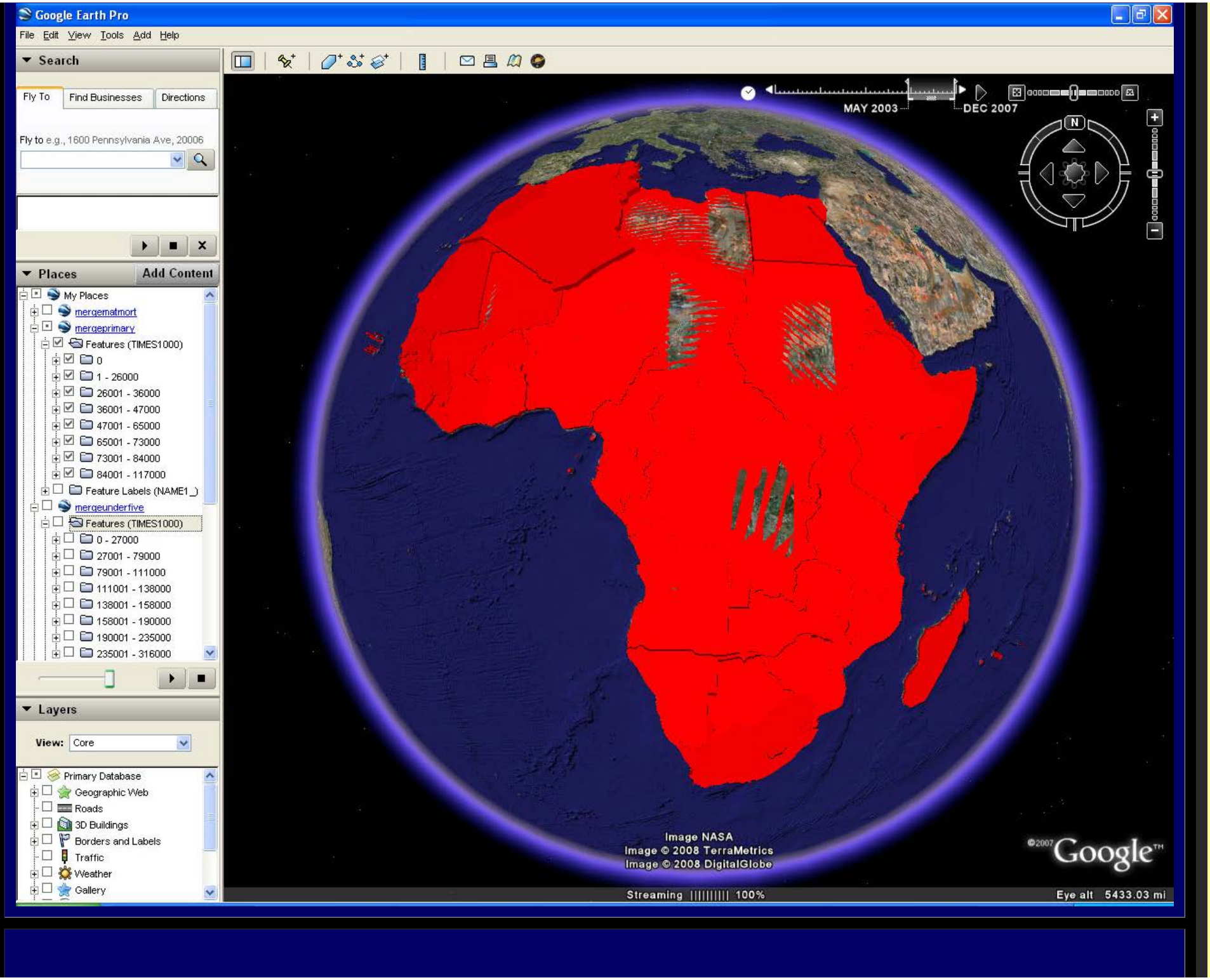


- **Primary Completion Indicator. One way to separate layers is to color each layer a single color (top frame below)--red in this case. The height of the polygons**

within a layer gives information about the individual countries even though all polygons are the same color. Tip the display on its side to get a better view (second frame below). Zoom in to see more clearly. Take a better look at the coastal nations of West Africa.

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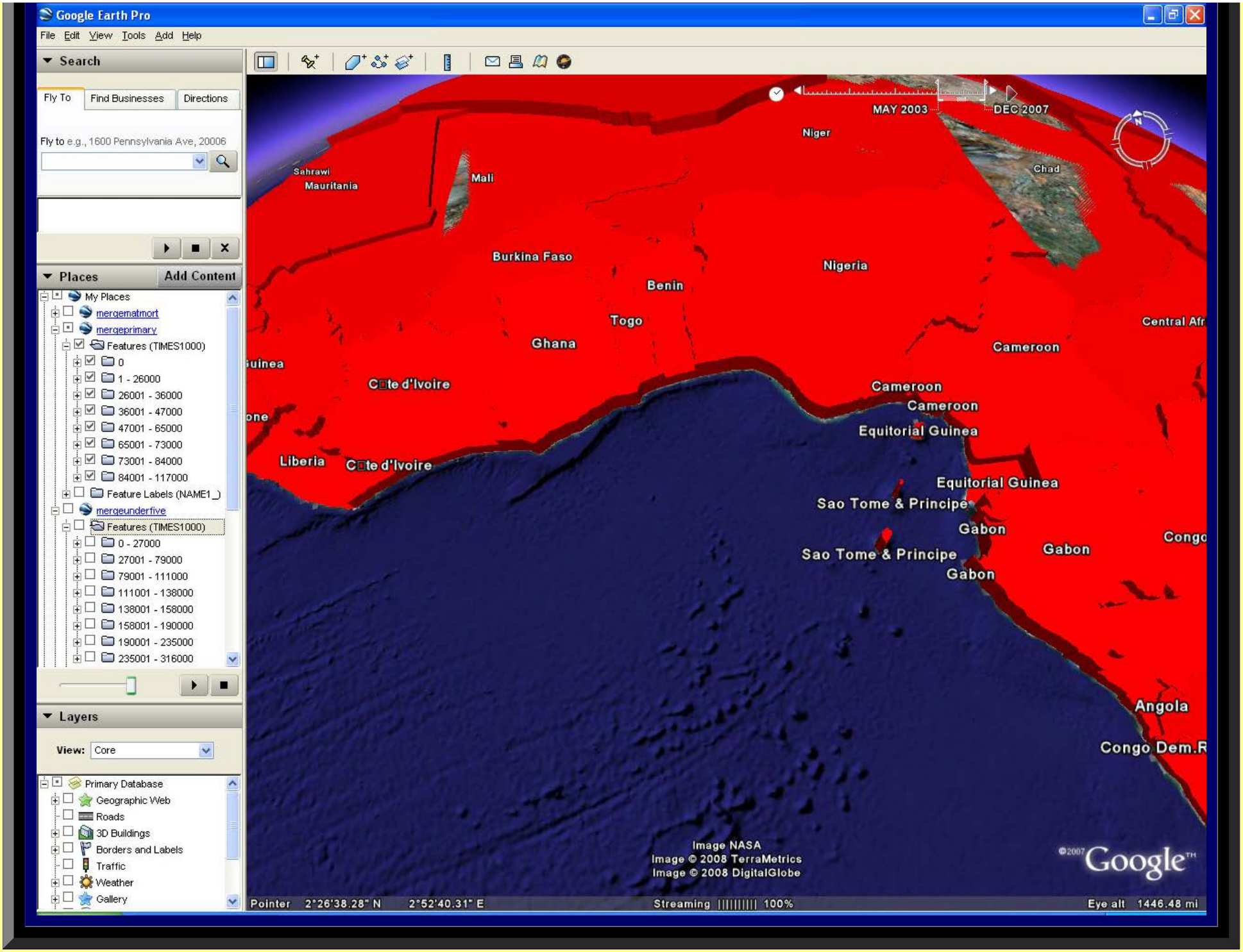
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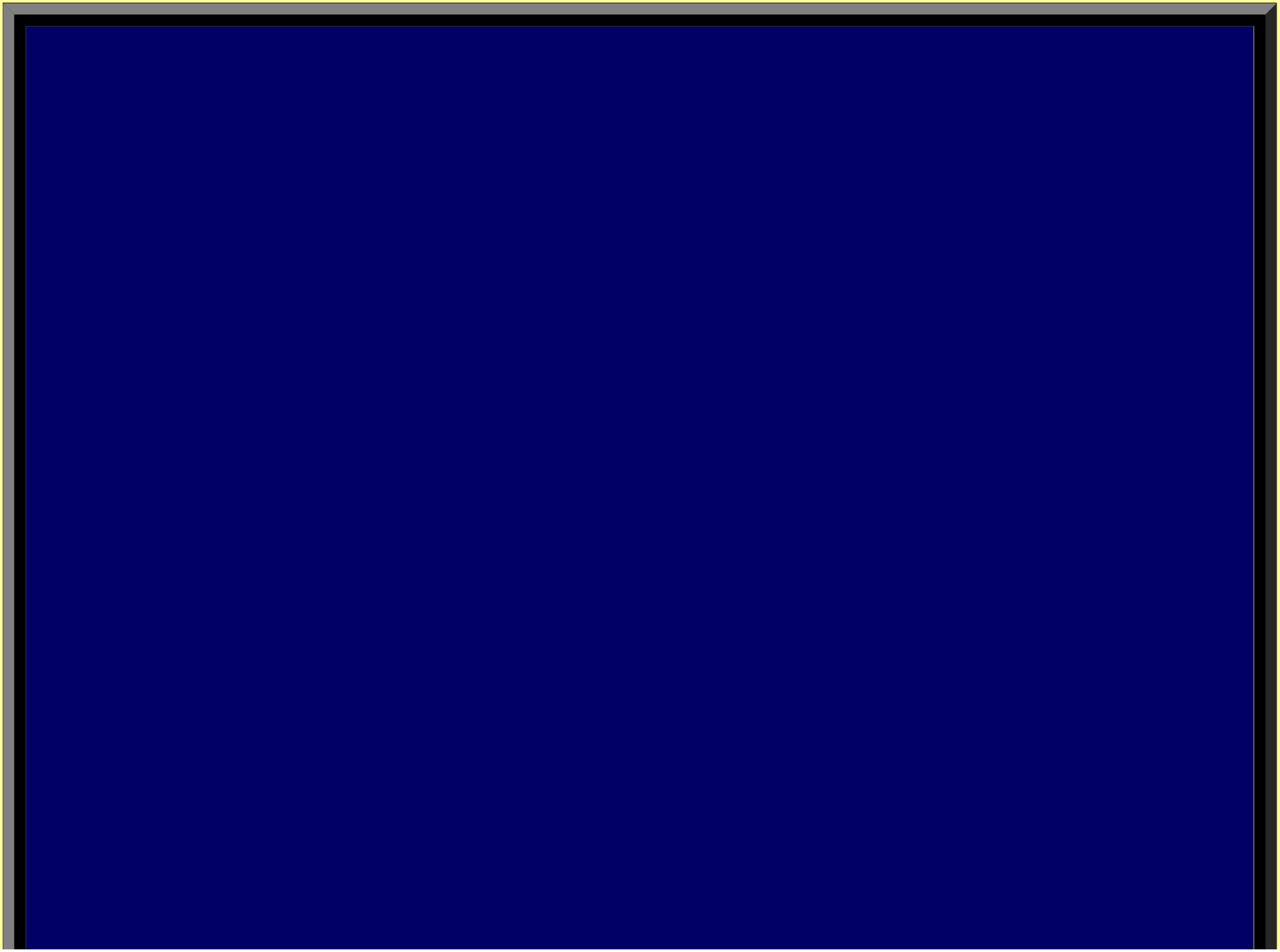
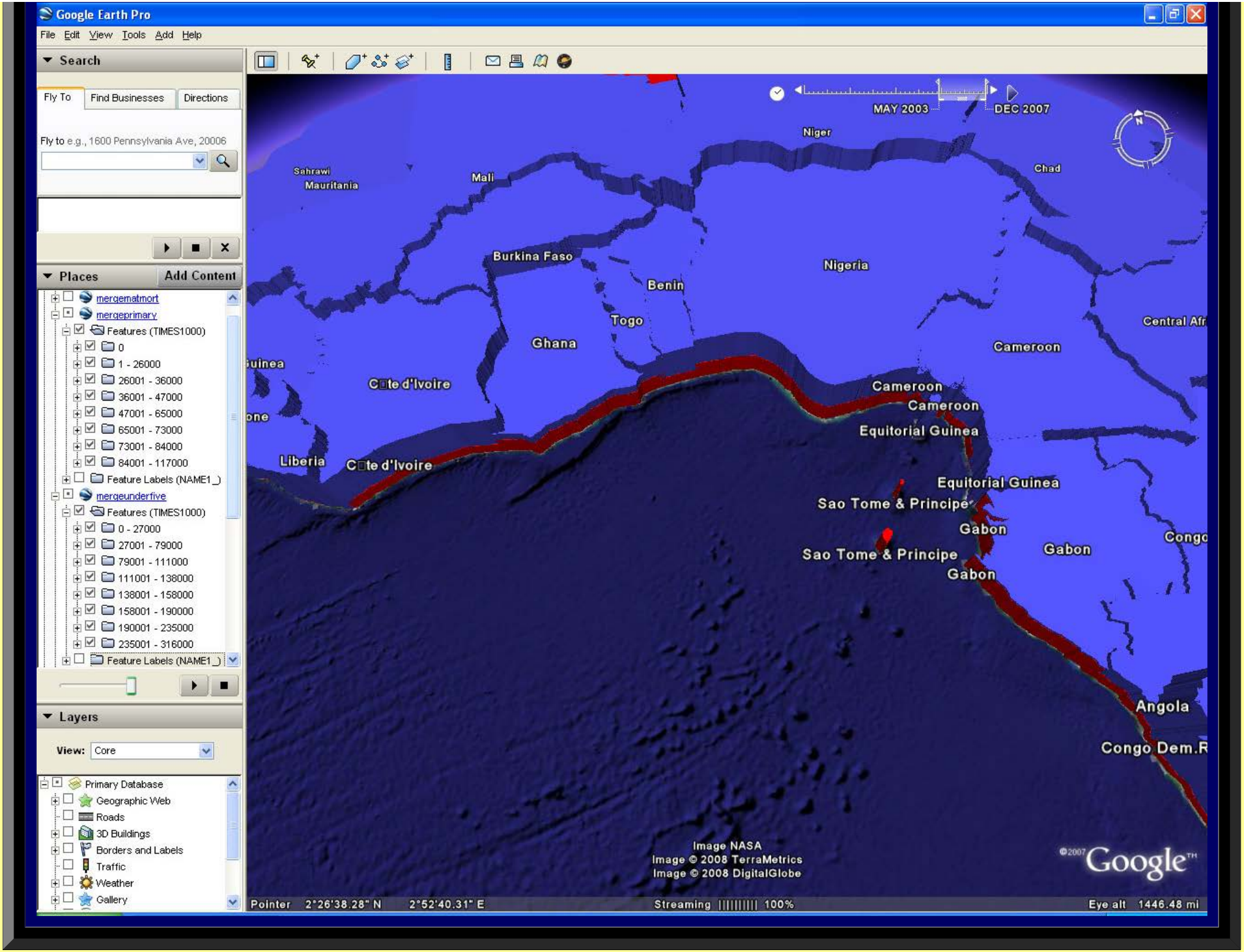
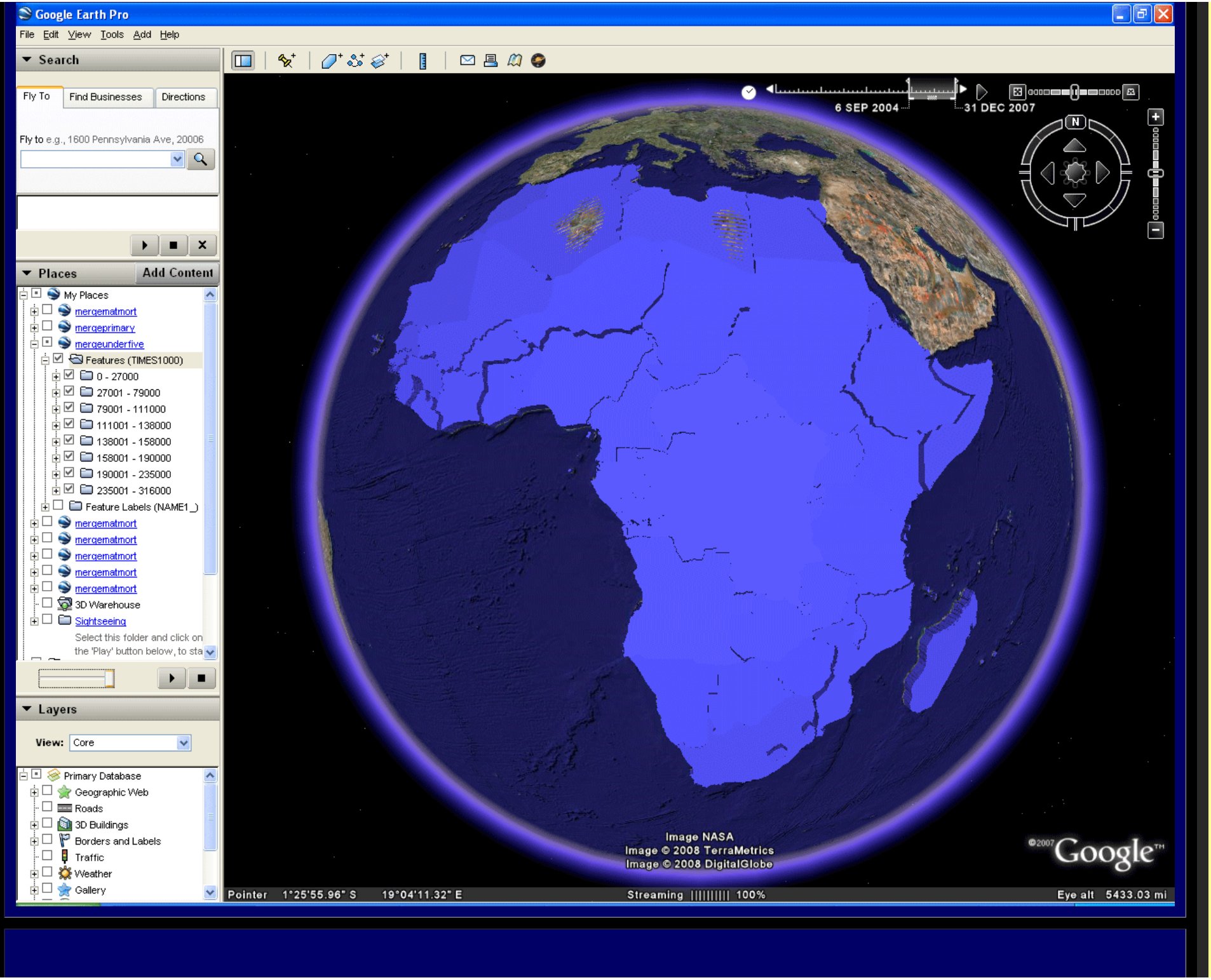
- **The two indicators together. When the blue and red layers are both clicked on at the same time, red and blue strata are evident at the edge, where there is a "cut" in the surface. Otherwise, it remains difficult to visualize the two together. The blue layer dominates in most cases.**





One way to solve this problem is to make the dominant color semi-transparent--in this case, the blue layer is made 50% transparent. Thus, red shows through

the blue and gives a purple cast to regions of double color. Elsewhere, the higher value color dominates. Note the Moiré effects in Southern Africa suggesting coplanar polygons representing similar values. Naturally, both colors could be made of varying degrees of opaqueness. More indicators could be added, as well. The sequence of images below shows the merits of this scheme. It works best when contrasting bright colors are chosen; the larger the number of colors/layers, the more one has to pay attention to color mixing strategy.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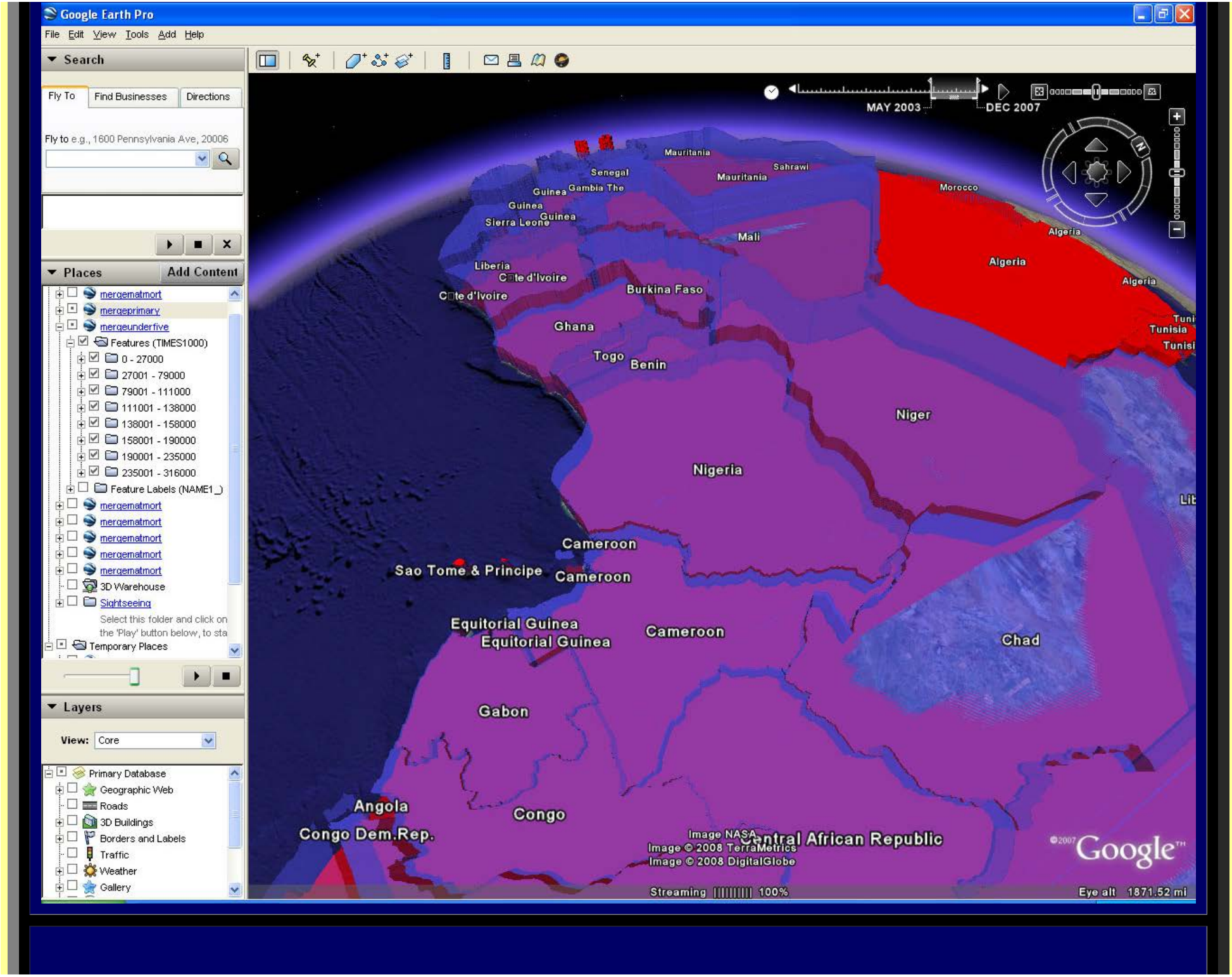
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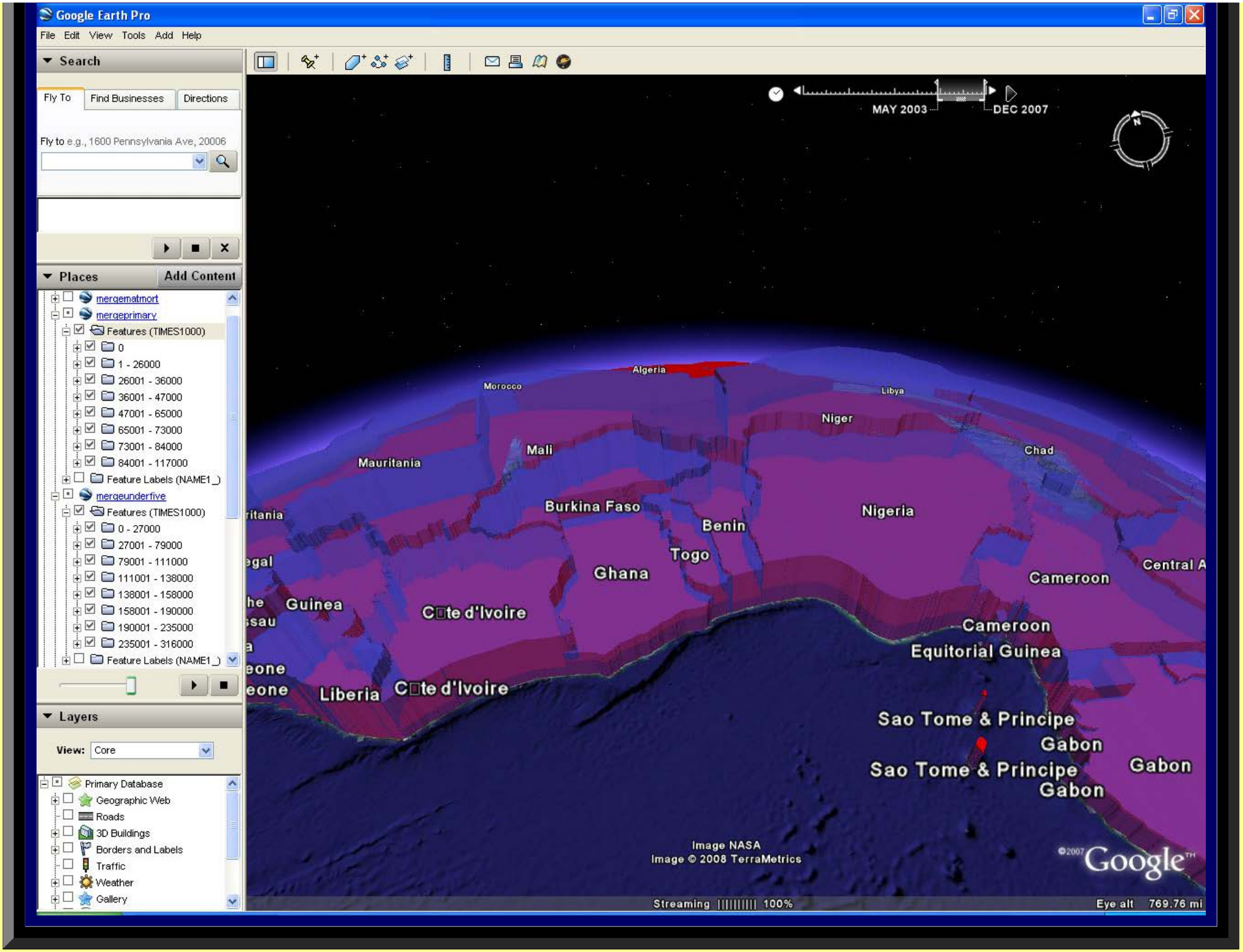
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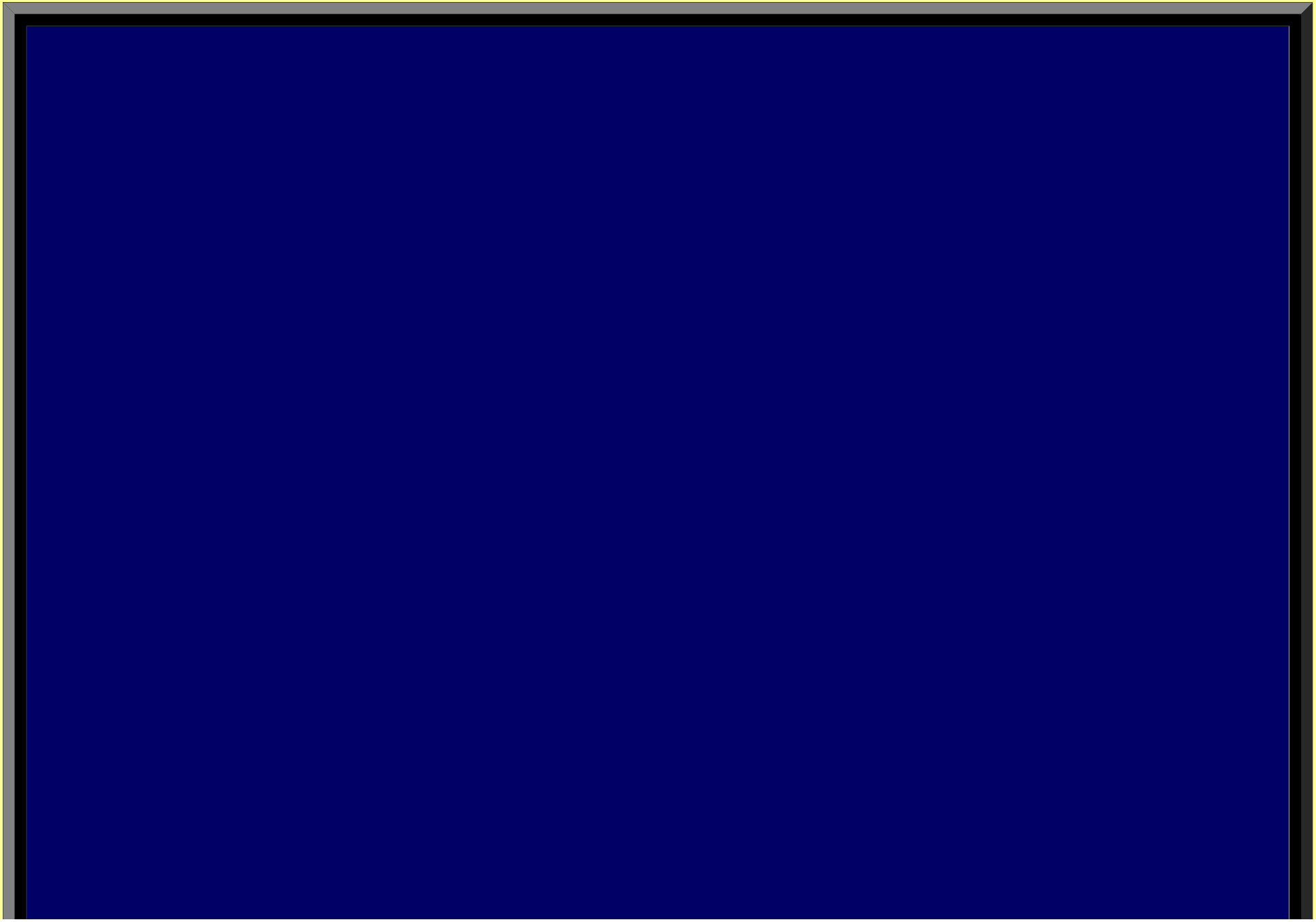
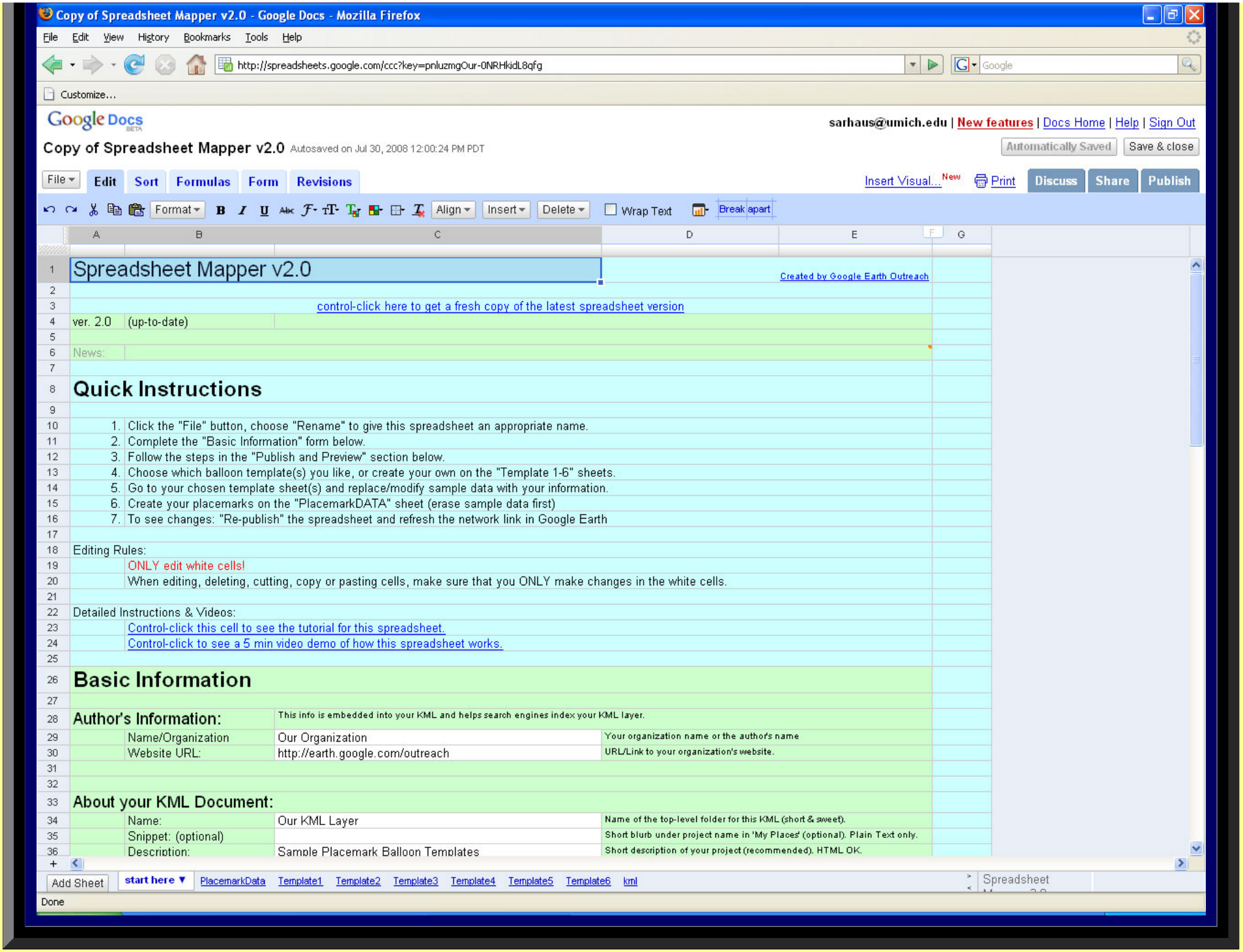
- **Additional resources from Google Earth: these may aid in analysis.**
  - **Downloaded Spreadsheets:**
    - **Google Spreadsheet Mapper enables the user to enter a large number of placemarks from an online spreadsheet. The spreadsheet will hold up to 400 entries.**
    - **Sample image of the top part of an online spreadsheet.**





- **Google Earth API (Application Programming Interface):**

- **Embed a running window of Google Earth in a webpage**
- **Screen capture of such an embedding**

Google Earth API - Google Code - Mozilla Firefox

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http://code.google.com/apis/earth/

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Google Code

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e.g. "ajax apis" or "open source"

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Google Earth API

Home Docs FAQ Blog Group Terms

What is the Google Earth API?

The Google Earth Plug-in and its JavaScript API let you embed Google Earth, a true 3D digital globe, into your web pages. Using the API you can draw markers and lines, drape images over the terrain, add 3D models, or load KML files, allowing you to build sophisticated 3D map applications. If you have an existing Maps API site, you can 3D-enable your page with as little as one line of code.

4.3.9597.9390

The Google Earth API is a free beta service, available for any web site that is free to consumers. Please see the terms of use for more information.

How do I start?

1. Check out some Google Earth Plug-in examples.
2. Sign up for a Google Maps API key.
3. Read the Google Earth API Developer's Guide.
4. Read the Google Earth API Reference.

Featured Video

Learn more about the Google Earth API

Google Geo Developers Blog

New Earth API resources: Complete API Reference, Sample Code, Release Notes, FAQ

Aug 7, 2008

Posted by Mano Marks, Geo Developer Advocate This has been a busy week! We've released four new resources to help you...

Community

Community

Search in a KML file

Hi there I have a network link which containes a number of streets. I want to search a specified street throgh them ...

Done

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Software used in analysis:

- DevInfo 5.0: http://www.devinfo.org/
- Adobe® PhotoShop and ImageReady
- Adobe® DreamWeaver
- ESRI:
  - ArcView® 3.2
  - ArcGIS® 9.2
    - ArcCatalog®
    - ArcMap®
- Google Earth®

Author affiliations:

- Arlinghaus, Sandra Lach. Adjunct Professor of Mathematical Geography and Population-Environment Dynamics, School of Natural Resources and Environment, The University of Michigan. Executive Committee Member (Secretary) Community Systems Foundation, sarhaus@umich.edu, http://www-personal.umich.edu/~sarhaus/
- Naud, Matthew. Environmental Coordinator and Assistant Emergency Manager, Systems Planning Unit, City of Ann Arbor
- Oswalt, Kris S. President, Community Systems Foundation
- Rayle, Roger. Scio Residents for Safe Water
- Lars Schumann. Manager and Research Computer Specialist, University of Michigan 3D Laboratory at the Duderstadt Center; also of Cornell University, Ithaca NY
- Arlinghaus, William C. Professor of Mathematics and Computer Science, Lawrence Technological University, Southfield, MI
- Arlinghaus, William E. General Manager, Chapel Hill Memorial Gardens, Grand Rapids, MI
- Batty, Michael. Bartlett Professor of Planning and Director of the Centre for Advanced Spatial Analysis (CASA) at University College London
- Haug, Robert. Ph.D. Candidate, Middle Eastern and North African Studies, The University of Michigan
- Larimore, Ann Evans. Professor Emerita, Residential College, The University of Michigan
- Longstreth, Karl. Head, Map Library, The University of Michigan
- Nystuen, Gwen L. Parks Advisory Commission; Environmental Commission; City of Ann Arbor
- Nystuen, John D. Professor Emeritus of Geography and Urban Planning, Taubman College of Architecture and Urban Planning, The University of Michigan. Chief Executive Officer, Community Systems Foundation

Published by:
Institute of Mathematical Geography

http://www.imagenet.org
http://deepblue.lib.umich.edu/handle/2027.42/58219
August, 2008.

Spatial Synthesis
Volume II, Book 1:
Scientific, Planning, Humanitarian, and Teaching Applications, From DevInfo to Google Earth

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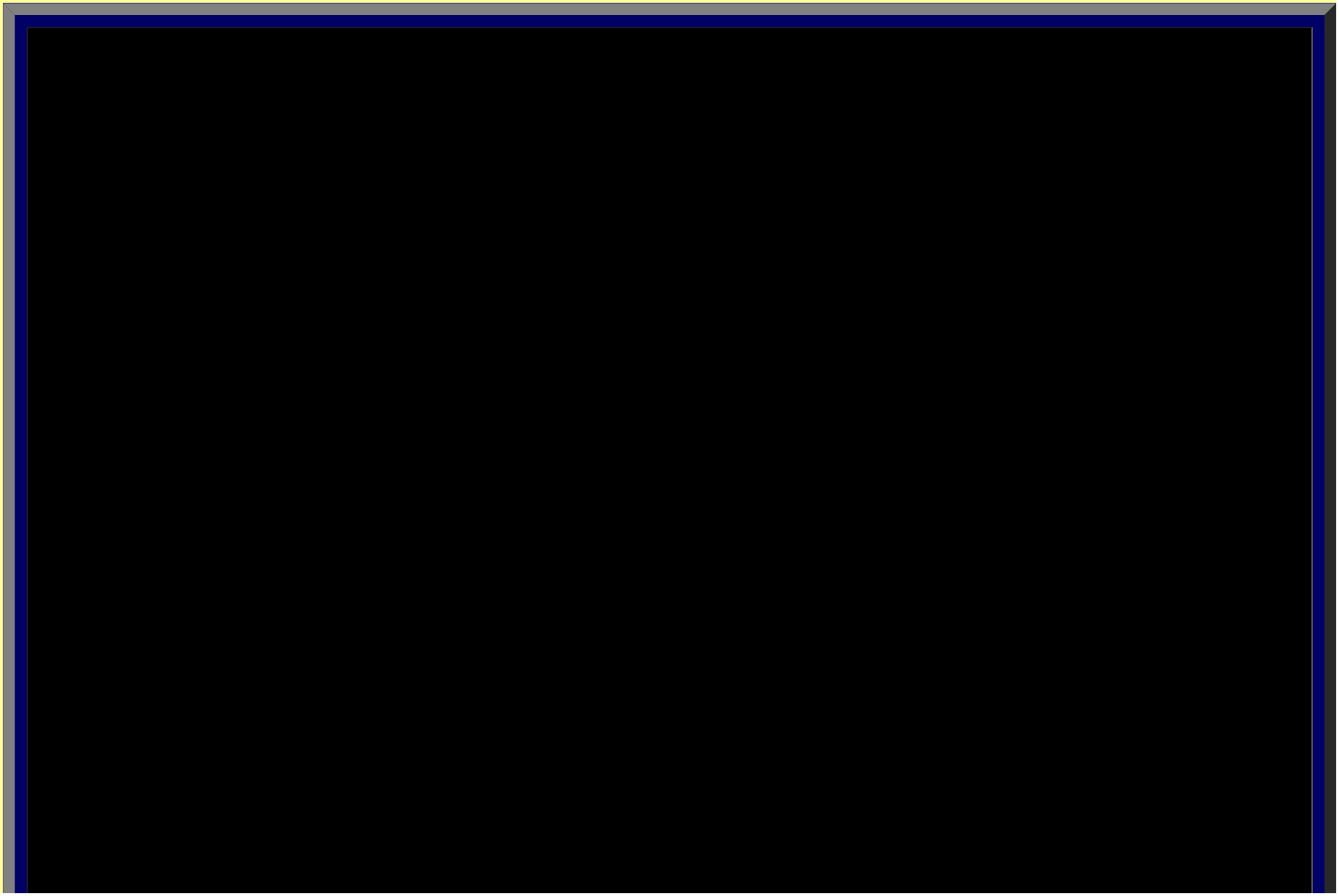

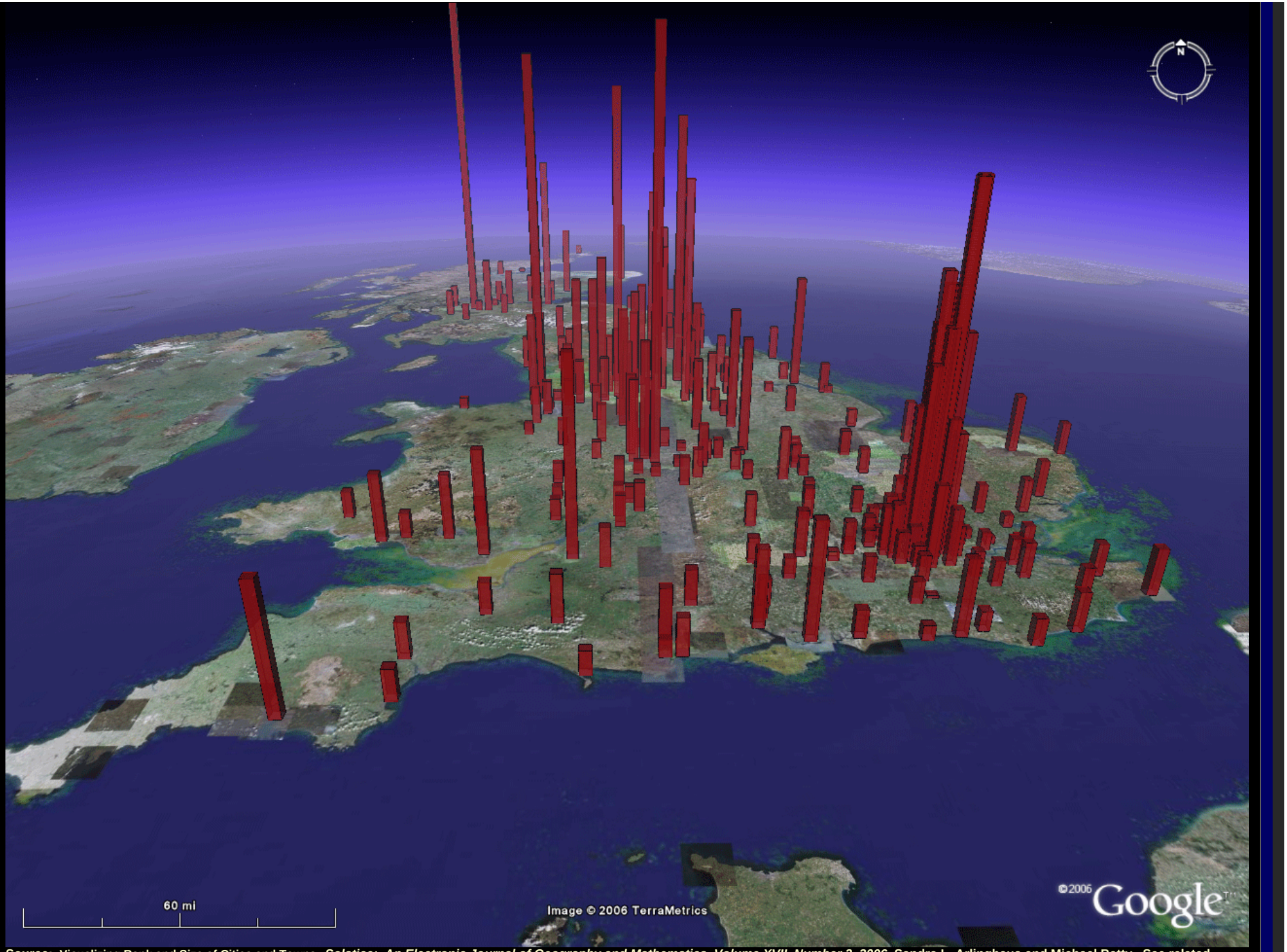

Source: Visualizing Rank and Size of Cities and Towns. *Solstice: An Electronic Journal of Geography and Mathematics, Volume XVII, Number 2, 2006,* Sandra L. Arlinghaus and Michael Batty. See related material below.

- ## Selected Current Applications

  - ***Municipal Scientific Applications*--Matthew Naud and Roger Rayle**

    - **M. Naud--Argo Dam removal and Google Earth**
      - **Publication in *Solstice: An Electronic Journal of Geography and Mathematics*, Volume XIX, Number 1. Huron River Tour, Ann Arbor**
      - **Communications with professional hydrologists in an effort to integrate the contemporary electronic capability within the traditional hydrological settings often presented to municipal authorities.**

    - **R. Rayle--Wells on the west side of Ann Arbor: update from 2007: Use of spreadsheets and Mail Merge with Google Earth.**
      - **Presentation notes, October 11, 2008.**
      - **Publication in *Solstice: An Electronic Journal of Geography and Mathematics*, Volume XIX, Number 1. Google Earth Applications in a Community Information System: Scio Residents for Safe Water**

  - ***Population-Environment Dynamics Planning Applications*--Sandra Arlinghaus, Matthew Naud, Gwen Nystuen, and John Nystuen**

    - **S. Arlinghaus, G. Nystuen, J. Nystuen: Continued modeling of the Ann Arbor CBD following up on the efforts presented in the linked materials below--**

      - ***3D Atlas of Ann Arbor, 1st Edition*. Editor and principal author: Sandra Lach Arlinghaus with co-authors noted throughout. June, 2006.**
      - ***3D Atlas of Ann Arbor, 2nd Edition*. Sandra Lach Arlinghaus, November, 2006.**
      - ***3D Atlas of Ann Arbor, 3rd Edition*. Sandra Lach Arlinghaus with input from others noted throughout. June 2007.**

      G. Nystuen suggests that the City of Ann Arbor should commission (for a fee) the modeling of the effects of changes to the zoning ordinance as currently proposed. That idea would "sell" the idea of work already donated for this purpose to the Downtown Development Authority and the City of Ann Arbor in 2004 and chronicled in both the Ann Arbor News and in a linked article: Arlinghaus, Beal, and Kelbaugh: The View from the Top: Visualizing Downtown Ann Arbor in Three Dimensions. J. Nystuen notes that, since 2004, we are now faced with the unintended extremes that had been mere possibilities in the past but are now proposed under the Cxx zones as amended in 2006. A new zoning scheme is proposed in which the D1D2 zoning replaces all Cxxx zones. It would be interesting to zoom around in the virtual Ann Arbor world to show some possible scenarios that could occur under the new D1 and D2 zones. The results would be dramatic--all the more so today than in 2004 (and earlier presentations of similar material) when 3D modeling was so new that it was difficult for all but a handful of municipal authorities to appreciate.

    - **S. Arlinghaus and M. Naud: Continuing analysis of 3D flood population-environment models.**

      This work follows up on earlier analysis present in the 3D Atlases of Ann Arbor (linked above) and also in models present in the Google SketchUp 3D Warehouse. See the Collections by Archimedes (pseudonym of S. Arlinghaus). Many of Archimedes's models have achieved "Blue Ribbon" status and are therefore part of the default set of materials in Google Earth (Archimedes is also a "Featured Modeler" in the 3D Warehouse). Other models can be downloaded directly from the 3D warehouse.

  - ***Live Feed Humanitarian Applications*--Lars Schumann and Kris Oswalt**

    - **K. Oswalt:**
      - **Throughout a lot of the developing world, each time a water engineer applies for reimbursement for drilling or maintaining a village well, the lat/lon coordinates are recorded. This is in lieu of giving the bore well a name and to avoid "duplicate billing". Thousands of wells are under construction, repair, maintenance, etc. It would be very interesting to map this. The data (lat/lon and status of the well) might be captured by SMS over cell phone since most of the engineers have cell phones in these areas.**
      - **School teachers in Uganda are using cell phone technology to send in answers to 6 key questions on a regular basis. It would be interesting to map this in real time as the number of schools increases in the network.**
      - **Emergency field workers could be tracked while doing initial rapid assessments in the first 72 hours after an emergency.**

    - **L. Schumann:**
      - **Magic Bus. Publication in *Solstice: An Electronic Journal of Geography and Mathematics*, Volume XIX, Number 1. Real-time Animation Scripts for Google Earth**
      - **Existing work of 3D Lab in Emergency Management**

  - **Ongoing Teaching Applications--Sandra Arlinghaus, Robert Haug, Ann Larimore, and Karl Longstreth**

    - **S. Arlinghaus. R. Haug, A. Larimore and K. Longstreth:**

- **Maps, Timelines, and the Internet: the Quest for Peace in the Middle East: Ann E. Larimore with Sandra L. Arlinghaus, Robert Haug, and Karl Longstreth. An existing course structure developed by Larimore is now in its third year of classroom use (2005, 2007, 2008). The future might see the integration of DevInfo data (live-feed or otherwise) in this web-based approach that integrates space and time using maps and timelines; it already employs Google Earth in a scientific/teaching mode. Related articles:**
  - **Ann Evans Larimore with Sandra Lach Arlinghaus and Robert Haug, A Methodology for Historical Geography: Internet Implementation *Solstice: An Electronic Journal of Geography and Mathematics*, Volume XVI, Number 1, 2005.**
  - **Sandra Arlinghaus, Robert Haug, Ann Larimore Lewis and Clark, 200 Years: A Visual Tribute to an Exploration. The Gates of the Rocky Mountains. *Solstice: An Electronic Journal of Geography and Mathematics*, Volume XIV, Number 2, 2003**

- **S. Arlinghaus:**

  Continuing work with Ph.D. and other students in a one-on-one setting to teach them to integrate new software, particularly those that permit the visualization of 3D images, with their own data. The primary method used at present is to analyze the data in ESRI's ArcMap and export the results to Google Earth using the strategy set forth in this document.

Directing the Past toward the Future

Scientific Applications

- **Integration of software: Atlas 2008, Sandra L. Arlinghaus and Kris S. Oswalt. Extension of the processes in this Atlas to the entire DevInfo database perhaps with integration of technique into DevInfo or related software.**

- **Data Compression:**
  - **Sandra L. Arlinghaus and Michael Batty. *Solstice: An Electronic Journal of Geography and Mathematics, Volume XVII, Number 1.* Zipf's Hyperboloid? Use by the first author to develop ideas of hyperbolic geometry realized on the Poincaré Disk and interpreted on the sphere. Suggested realization of ideas using data of second author involving rank-size changes over time. This first article led to a series of others. It might well lead to other projects involving DevInfo with integration of interests from London to Ann Arbor to New Delhi using, perhaps, the interface of non-Euclidean geometry.**
  - **Sandra L. Arlinghaus and John D. Nystuen. The Animated Pascal Sandra Lach Arlinghaus, *Solstice: An Electronic Journal of Geography and Mathematics, Volume XVIII, Number 2*.** This article includes the Google Earth sphere draped with one of Escher's "Circle Limit" series (realized using the Poincaré Disk) thus reinforcing visualization of the origins of the Escher art with material associated with data compression and hyperbolic geometry. John Nystuen noted the utility of rotating the sphere to bring data into view at different scales--so that what was once small and in the distance becomes large and up close as the sphere is rotated.

Planning Applications

- **Visualizing Rank and Size of Cities and Towns. *Solstice: An Electronic Journal of Geography and Mathematics, Volume XVII, Number 2,* Sandra L. Arlinghaus and Michael Batty. See figure at top of this page from this source.**
  - **Part I: England, Scotland, and Wales, 1901-2001**
  - **Part II: Greater London, 1901-2001**

  Here, Arlinghaus extended work done with Google Earth Ann Arbor tall buildings (housed in the Google 3D Warehouse as "Archimedes") in seeing the patterns they create as Google Earth "bar charts" Batty supplied the needed data from his comprehensive set to run preliminary tests of this scientific application in population-environment dynamics.

- **Visualizing a Map of Walter Christaller, Poland 1941. *Solstice: An Electronic Journal of Geography and Mathematics, Volume XVII, Number 2,* Sandra Lach Arlinghaus.**
  - **Part I: Benchmarking the Map.**
  - **Part II: Interpolation of the Benchmarked Map.**

  This scientific/planning application of Google Earth draws concepts from classical cartography into the rich environment of Google Earth. In so doing, it derives strength from far-flung earlier work involving 3D modeling of mathematical, scientific, and envisioning concepts.

- **Continuation of Spatial Synthesis Series of E-Books: Sandra L. Arlinghaus and William C. Arlinghaus. Volume I, Book 1 dealt with theory primarily and set the stage for continuation in Volume I of theoretical developments through multiple "books." Volume II is devoted to application--turing theory into practice. Links related to material in both volumes are listed below. Many others appear on the website of the Institute of Mathematical Geography (Deep Blue link to archive of IMaGe) both in the E-Books section and also in *Solstice: An Electronic Journal of Geography and Mathematics* (Pirelli INTERNETional Award Semi-Finalist, Top**

80 of over 1000 worldwide entries).

- **2007: *Solstice* (all by S. Arlinghaus). Special Issue on Projective Geometry Constructions; Geo/metry/graphy -- Visual Unity; Desargues's Two-Triangle Theorem.**
- **2006: *Solstice*. Banda Aceh: A View on the Globe; 3D Atlas of Ann Arbor: The Google Earth Approach, Part I; 3D Atlas of Ann Arbor: The Google Earth Approach, Part II.**
- **2005: Book. *Spatial Synthesis, Volume I: Centrality and Hierarchy. Book 1*. Arlinghaus, Sandra Lach and Arlinghaus, William Charles. June 21.**
- **2005: *Solstice*. Sandra Lach Arlinghaus Spatial Synthesis,The Evidence of Cartographic Example: Hierarchy and Centrality ; Sandra L. Arlinghaus et al. Kioskland: A Strategy for Linking Hierarchical Levels of Virtual Reality Maps ; Sandra Lach Arlinghaus, Spatial Synthesis: Investigations in Progress**
- **2004: *Solstice*. Sandra Lach Arlinghaus and William Charles Arlinghaus. Spatial Synthesis Sampler. Geometric Visualization of Hexagonal Hierarchies: Animation and Virtual Reality. This article finished as a "Semi-finalist" in the Pirelli INTERNETional Award Competition (top 80 of over 1400 worldwide entries).**
- **2004: *Solstice*. Sandra L. Arlinghaus, Fred J. Beal, and Douglas S. Kelbaugh The View from the Top: Visualizing Downtown Ann Arbor in Three Dimensions . An image from this article was featured on the front page of the Ann Arbor News.**
- **2004: *Solstice*. Klaus-Peter Beier, One Optimization of an Earlier Model of Virtual Downtown Ann Arbor.**
- **2003: *Solstice*. Sandra Lach Arlinghaus, Spatial Syntheiss: 3D Atlas of Ann Arbor; Sandra Arlinghaus, Michael Batty, and John Nystuen, Animated Time Lines: Coordination of Spatial and Temporal Information; Sandra Lach Arlinghaus, Ann Arbor, Michigan: Virtual Downtown Experiments; Sandra Lach Arlinghaus, Tornado Siren Location: Ann Arbor, Michigan (this work was featured in the Ann Arbor News). Also, Sandra Lach Arlinghaus, Ann Arbor Michigan: Virtual Downtown Experiments, Part II; Taejung Kwon, Adrien A. Lazzaro, Paul J. Oppenheim, Aaron Rosenblum Ann Arbor, Michigan: Virtual Downtown Experiments Part III.**
- **2002: Book. Sandra L. Arlinghaus, William C. Arlinghaus, Frank Harary. *Graph Theory and Geography: An Interactive View E-Book*, John Wiley and Sons. This book was Wiley's first eBook.**
- **2002: *Solstice*. Sandra Arlinghaus, Salma Haidar, and Mark Wilson, Animated Map Timeline, Syria; Sandra L. Arlinghaus and William C. Arlinghaus, Spatial Synthesis: A Research Program.**

- ***Humanitarian Applications***

- **Development of Live Feed in association with Google Earth and humanitarian projects involving DevInfo and CSF work are in progress. The mechanism is in place with dedicated server space including cgi capability. Experiments with PERL are underway.**

- **Perimeter Project--Sandra L. Arlinghaus, William E. Arlinghaus, and Kris Oswalt. Lands on which people are buried are among those most highly protected by law and tradition in many societies. This work would involve a collaborative effort to identify valued lands (often "perimeter" lands) and protect them using established attitudes toward the status of burial grounds. "Green" cemeteries already do preserve broad swaths of land. There are over 200 of them in Great Britain and a handful in the U.S.A. To date, they are present only in developed nations. The collaboration here might involve working with a land trust and the state (or similar entities) as well as with scholars and local authorities with expertise in burial tradition. It might involve a special form of DevInfo (ConservInfo?) to manage records and to engage in networking involving burial practice in relation to land conservation throughout the world. DevInfo currently affords opportunity for data collection related to protection of the world's people--why not also to the protection of the world's lands? The records might be tracked in Google Earth, with live feed. Members might receive virtual memorialization (trust-funded and assigned permanent urls) through established collaborative effort. Amalgamation of desirable parcels would become an interesting challenge and might draw constructive insight from various planning strategies. Michigan's perimeter lands might serve as a pilot project to develop systematic strategy to extend elsewhere. The word "perimeter" refers not only to the obvious interface between land and water but also to more subtle interfaces...indeed, even to one between life and death!**

- ***Teaching Applications***

Maps and Decisions: an existing course structure (developed by S. Arlinghaus) in which the underlying philosophy is that the decisions we make influence the maps that we make AND that the maps we make influence the decisions we make. The future might see the development of more than course material, possibly employing DevInfo data (live-feed or otherwise) in the existing Internet environment. Related article, Sandra Lach Arlinghaus Maps and Decisions: Allen's Creek Floodplain, Opportunity or Disaster? *Solstice: An Electronic Journal of Geography and Mathematics*, Volume XIII, Number 1, 2001. The methods developed in this earlier course extend into current teaching strategies, as well.

TABLE OF CONTENTS

- **ASSESSMENT:**
- **ANALYSIS:**
- **ACTION:**
- **FEEDBACK:**

Software used in analysis:

- DevInfo 5.0: http://www.devinfo.org/
- Adobe® PhotoShop and ImageReady
- Adobe® DreamWeaver
- ESRI:
  - ArcView® 3.2
  - ArcGIS® 9.2
    - ArcCatalog®
    - ArcMap®
- Google Earth®

Author affiliations:

- Arlinghaus, Sandra Lach. Adjunct Professor of Mathematical Geography and Population-Environment Dynamics, School of Natural Resources and Environment, The University of Michigan. Executive Committee Member (Secretary) Community Systems Foundation, sarhaus@umich.edu, http://www-personal.umich.edu/~sarhaus/
- Naud, Matthew. Environmental Coordinator and Assistant Emergency Manager, Systems Planning Unit, City of Ann Arbor
- Oswalt, Kris S. President, Community Systems Foundation
- Rayle, Roger. Scio Residents for Safe Water
- Lars Schumann. Manager and Research Computer Specialist, University of Michigan 3D Laboratory at the Duderstadt Center; also of Cornell University, Ithaca NY
- Arlinghaus, William C. Professor of Mathematics and Computer Science, Lawrence Technological University, Southfield, MI
- Arlinghaus, William E. General Manager, Chapel Hill Memorial Gardens, Grand Rapids, MI
- Batty, Michael. Bartlett Professor of Planning and Director of the Centre for Advanced Spatial Analysis (CASA) at University College London
- Haug, Robert. Ph.D. Candidate, Middle Eastern and North African Studies, The University of Michigan
- Larimore, Ann Evans. Professor Emerita, Residential College, The University of Michigan
- Longstreth, Karl. Head, Map Library, The University of Michigan
- Nystuen, Gwen L. Parks Advisory Commission; Environmental Commission; City of Ann Arbor
- Nystuen, John D. Professor Emeritus of Geography and Urban Planning, Taubman College of Architecture and Urban Planning, The University of Michigan. Chief Executive Officer, Community Systems Foundation

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August, 2008.

Spatial Synthesis
Volume II, Book 1:
Scientific, Planning, Humanitarian, and Teaching Applications, From DevInfo to Google Earth

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FEEDBACK

- **Earlier work using 3D models in municipal application.**
  - ***3D Atlas of Ann Arbor, 1st Edition*, contains links to the history and feedback on this topic.**
  - **Subsequent editions of the *3D Atlas of Ann Arbor, 2nd Edition*, and *3rd Edition*, bring the reader up to a more current state. http://www.imagenet.org/**
  - **Models constructed of Ann Arbor for a Committee of the Downtown Development Authority and presented in public hearing in Council Chambers, Ann Arbor City Hall. Chronicled in the *Ann Arbor News* (front page).**
- **Demostrations have been given in the 3D Laboratory of The University of Michigan to a variety of municipal groups, representatives of groups, and others, including**
  - **Ann Arbor City Council members**
  - **City of Ann Arbor Planning Director**
  - **City of Ann Arbor Environmental Coordinator and Staff**
  - **University of Michigan Space Information and Planning, Plant Extension--AEC, members**
  - **City of Ann Arbor Planning Commission members**
  - **Allen Creek Watershed group members**
  - **League of Women Voters Board members**
  - **Executive Director of the Downtown Development Authority of Ann Arbor**
  - **Reporters from the *Ann Arbor News* and the *Ann Arbor Observer*.**
- **Potential for use of 3D modeling with CSF projects and data:**
  - **Presentations at CSF Annual Meetings archived on CSF webpage archive: http://www.csfnet.org/**
  - **Publication in *Solstice: An Electronic Journal of Geography and Mathematics*, Volume XVII, Number 2. Sandra Lach Arlinghaus, Banda Aceh: A View on the Globe**

TABLE OF CONTENTS

- **FEEDBACK:**

Software used in analysis:

- DevInfo 5.0: http://www.devinfo.org/
- Adobe® PhotoShop and ImageReady
- Adobe® DreamWeaver
- ESRI:
  - ArcView® 3.2
  - ArcGIS® 9.2
    - ArcCatalog®
    - ArcMap®
- Google Earth®

Author affiliations:

- Arlinghaus, Sandra Lach. Adjunct Professor of Mathematical Geography and Population-Environment Dynamics, School of Natural Resources and Environment, The University of Michigan. Executive Committee Member (Secretary) Community Systems Foundation, sarhaus@umich.edu, http://www-personal.umich.edu/~sarhaus/
- Naud, Matthew. Environmental Coordinator and Assistant Emergency Manager, Systems Planning Unit, City of Ann Arbor
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- Longstreth, Karl. M.A. Head, Map Library, The University of Michigan
- Nystuen, Gwen L. Member, Parks Advisory Commission, City of Ann Arbor
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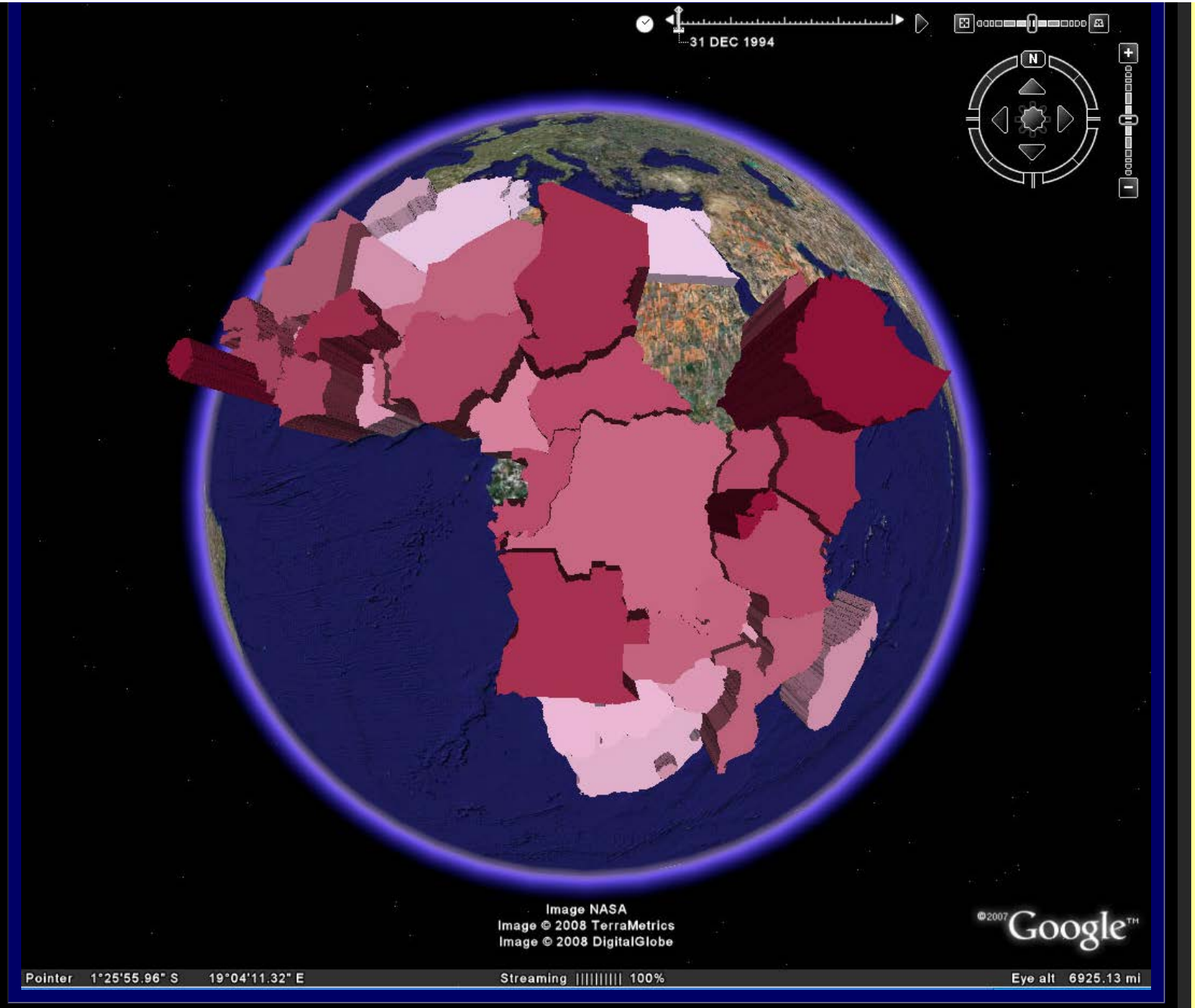
Spatial Synthesis

Volume II, Book 1:

Scientific, Planning, Humanitarian, and Teaching Applications, From DevInfo to Google Earth

ASSESSMENT--AFRICA

| Africa | Asia | Europe | Latin America | Northern America | Oceania |



The lists of available files from DevInfo for this region, filtered through various software packages including ESRI and Google Earth software, are given below (as they appear on the main Assessment page). For ideas of how to use them, please refer to the detailed, step-by-step, procedural guidelines farther down this page. The same strategy works for any region.

DevInfo

Indicators Available:

- **Maternal mortality ratio, Deaths per 100,000 Live Births, Total**
- **Prevalence of underweight (moderate and Severe), Percent, Total <5yr.**
- **Primary completion rate, Rate, Total**
- **Proportion of 1 year-old children immunised against measles, percent, total 1yr**
- **Proportion of births attended by skilled helath personnel, Percent, Total**
- **Proportion of population with access to improved sanitation, Percent, Total**
- **Proportion of population with sustainable access to an improved water source, Percent, Total**
- **Under-five mortality rate, Deaths per 1000 live births, Total**

Raw .apr Files:

- **Maternal mortality ratio, raw .apr**
- **Prevalence of underweight (moderate and severe)--Percent, Total < 5 yr., raw .apr**
- **Primary Completion Rate, Rate, Total, raw .apr**
- **Proportion of 1 year-old children immunised against measles, Percent, Total 1 yr., raw .apr**
- **Proportion of births attended by skilled health personnel, Percent, Total, raw .apr**
- **Proportion of population with access to improved sanitation, Percent, Total, raw .apr**
- **Proportion of population with sustainable access to an improved water source, Percent, Total, raw .apr**
- **Under-five mortality rate, Deaths per 1000 live births, Total, raw .apr**

ArcView 3.2+

Edited .apr Files:

- **Maternal mortality ratio, edited .apr**
- **Prevalence of underweight (moderate and severe)--Percent, Total < 5 yr., edited .apr**
- **Primary Completion Rate, Rate, Total, edited .apr**
- **Proportion of 1 year-old children immunised against measles, Percent, Total 1 yr., edited .apr**
- **Proportion of births attended by skilled health personnel, Percent, Total, edited .apr**
- **Proportion of population with access to improved sanitation, Percent, Total, edited .apr**
- **Proportion of population with sustainable access to an improved water source, Percent, Total, edited .apr**
- **Under-five mortality rate, Deaths per 1000 live births, Total, edited .apr**

ArcCatalog

Projected Shape Files:

- **Maternal mortality ratio: | dbf | prj | shp | shx |**
- **Prevalence of underweight (moderate and severe)--Percent, Total < 5 yr.: | dbf | prj | shp | shx |**
- **Primary Completion Rate, Rate, Total: | dbf | prj | shp | shx |**
- **Proportion of 1 year-old children immunised against measles, Percent, Total 1 yr.: | dbf | prj | shp | shx |**
- **Proportion of births attended by skilled health personnel, Percent, Total: | dbf | prj | shp | shx |**
- **Proportion of population with access to improved sanitation, Percent, Total: | dbf | prj | shp | shx |**
- **Proportion of population with sustainable access to an improved water source, Percent, Total: | dbf | prj | shp | shx |**
- **Under-five mortality rate, Deaths per 1000 live births, Total: | dbf | prj | shp | shx |**

ArcMap 9.2+

Set of Choropleth Maps from Shape Files:
All available indicators in a single file, mxd format

Raw .kml Files:

- **Maternal mortality ratio, kml**
- **Prevalence of underweight (moderate and severe)--Percent, Total < 5 yr., kml**
- **Primary Completion Rate, Rate, Total, kml**
- **Proportion of 1 year-old children immunised against measles, Percent, Total 1 yr., kml**
- **Proportion of births attended by skilled health personnel, Percent, Total, kml**
- **Proportion of population with access to improved sanitation, Percent, Total, kml**
- **Proportion of population with sustainable access to an improved water source, Percent, Total, kml**
- **Under-five mortality rate, Deaths per 1000 live births, Total, kml**

Google Earth

Edited .kml Files:

- **Maternal mortality ratio, edited kml**
- **Prevalence of underweight (moderate and severe)--Percent, Total < 5 yr., edited kml**
- **Primary Completion Rate, Rate, Total, edited kml**
- **Proportion of 1 year-old children immunised against measles, Percent, Total 1 yr., edited kml**
- **Proportion of births attended by skilled health personnel, Percent, Total, edited kml**
- **Proportion of population with access to improved sanitation, Percent, Total, edited kml**
- **Proportion of population with sustainable access to an improved water source, Percent, Total, edited kml**
- **Under-five mortality rate, Deaths per 1000 live births, Total, edited kml**

The animated figures below illustrate general visual sequences of software use. To see individual images, and figure captions for them supplying additional information, follow the link to the sequence of static shots associated with each animation.

SUMMARY OF CHAPTER CONTENT

SECTION 1: DEV INFO

Figure 1.1: The goal here is to show the reader how to launch the DevInfo software, an associated database, and a set of indicators from the database.

Figure 1.2: The goal here is to show the reader how to select time frames for analysis.

Figure 1.3: The goal here is to show the reader how to select geographic regions for analysis.

Figure 1.4: The goal here is to display the data selected for analysis of all indicators from Africa. Data is displayed both by country name and by indicator name. The latter display lets the user easily see which indicators have data associated with them. In this case, there are 8 different indicators:

Maternal mortality ratio
Prevalence of underweight (moderate and severe)--Percent, Total < 5 yr.
Primary Completion Rate, Rate, Total
Proportion of 1 year-old children immunised against measles, Percent, Total 1 yr
Proportion of births attended by skilled health personnel, Percent, Total
Proportion of population with access to improved sanitation, Percent, Total
Proportion of population with sustainable access to an improved water source, Percent, Total
Under-five mortality rate, Deaths per 1000 live births, Total

Figure 1.5: Here the reader is taken through an entire sequence of steps for extracting data for a single indicator and making a map from it. The map is exported to ArcView .apr format to be opened in the next stage in ArcView 3.x. Repeat this process for each indicator for which there is data.

RESULTANT FILES:

- Maternal mortality ratio, raw .apr
- Prevalence of underweight (moderate and severe)--Percent, Total < 5 yr., raw .apr
- Primary Completion Rate, Rate, Total, raw .apr
- Proportion of 1 year-old children immunised against measles, Percent, Total 1 yr., raw .apr
- Proportion of births attended by skilled health personnel, Percent, Total, raw .apr
- Proportion of population with access to improved sanitation, Percent, Total, raw .apr
- Proportion of population with sustainable access to an improved water source, Percent, Total, raw .apr
- Under-five mortality rate, Deaths per 1000 live births, Total, raw .apr

---

SECTION 2: ARC VIEW 3.2/3.3

Figure 2.1: The goal of this sequence of images is to show the reader how to open, in ArcView 3.2/3.3, one of the raw .apr files created in DevInfo.

Figure 2.2: The goal of this sequence of images is to show the reader how to launch, in ArcView 3.2/3.3, extensions to ArcView. One is selected that will be used to merge the layers. It is called the "Geoprocessing" extension.

Figure 2.3: The goal of this sequence of images is to show the reader how to use, in ArcView 3.2/3.3, the Geoprocessing extension to merge layers to a single shape file.

Figure 2.4: The goal of this sequence of images is to show the reader how to retrieve, in ArcView 3.2/3.3, the database, or "Attribute File," associated with a single shape file.

Figure 2.5: The goal of this sequence of images is to show the reader how to edit, in ArcView 3.2/3.3, the database, or "Attribute File," associated with a single shape file and to add a new blank data field (column).

Figure 2.6: The goal of this sequence of images is to show the reader how to fill a database field, in ArcView 3.2/3.3, with data converted to "number" format suitable for using to create choropleth maps.

Figure 2.7: The goal of this sequence of images is to show the reader how to create a database field, in ArcView 3.2/3.3, in "string" format suitable for creating date fields for the time slider in Google Earth.

Figure 2.8: The goal of this sequence of images is to show the reader how to fill a database field, in ArcView 3.2/3.3, in "string" format suitable for creating date fields for the time slider in Google Earth.

Figure 2.9: The goal of this sequence of images is to show the reader how to change entries in a database field, in ArcView 3.2/3.3, using the "edit" button. Frequent use will be made of the Windows universal commands, on highlighted text, of "ctrl +c" for "copy" and "ctrl +v" for "paste."

Figure 2.10: The goal of this sequence of images is to show the reader how to stop editing entries in a database field, in ArcView 3.2/3.3, and save them.

Figure 2.11: The goal of this sequence of images is to show the reader how to save and exit in ArcView 3.2/3.3.

RESULTANT FILES:

- **Maternal mortality ratio, edited .apr**
- **Prevalence of underweight (moderate and severe)--Percent, Total < 5 yr., edited .apr**
- **Primary Completion Rate, Rate, Total, edited .apr**
- **Proportion of 1 year-old children immunised against measles, Percent, Total 1 yr., edited .apr**
- **Proportion of births attended by skilled health personnel, Percent, Total, edited .apr**
- **Proportion of population with access to improved sanitation, Percent, Total, edited .apr**
- **Proportion of population with sustainable access to an improved water source, Percent, Total, edited .apr**
- **Under-five mortality rate, Deaths per 1000 live births, Total, edited .apr**

SECTION 3: ARC CATALOG

Figure 3.1: The goal of this sequence of images is to show the reader how to project the shape files produced in Section 2 so that they might be further processed later in both ArcMap and in Google Earth.

RESULTANT FILES:

- **Maternal mortality ratio:** | dbf | prj | shp | shx |
- **Prevalence of underweight (moderate and severe)--Percent, Total < 5 yr.:** | dbf | prj | shp | shx |
- **Primary Completion Rate, Rate, Total:** | dbf | prj | shp | shx |
- **Proportion of 1 year-old children immunised against measles, Percent, Total 1 yr.:** | dbf | prj | shp | shx |
- **Proportion of births attended by skilled health personnel, Percent, Total:** | dbf | prj | shp | shx |
- **Proportion of population with access to improved sanitation, Percent, Total:** | dbf | prj | shp | shx |
- **Proportion of population with sustainable access to an improved water source, Percent, Total:** | dbf | prj | shp | shx |
- **Under-five mortality rate, Deaths per 1000 live births, Total:** | dbf | prj | shp | shx |

SECTION 4: ARC MAP 9.X

Figure 4.1: The goal of this sequence of images is to show the reader how to create a choropleth map (ranged fill by data interval) from the edited .apr file extracted originally from DevInfo.

Figure 4.2: The goal of this sequence of images is to show the reader how to begin to generate a kml file for Google Earth from a choropleth map (ranged fill by data interval) from the edited .apr file extracted originally from DevInfo.

Figure 4.3: The goal of this sequence of images is to show the reader how to complete the generation of a kml file for Google Earth from a choropleth map (ranged fill by data interval) from the edited .apr file extracted originally from DevInfo.

RESULTANT FILES:

- **Set of choropleth maps for all available indicators, mxd**

format

- Maternal mortality ratio, kml
- Prevalence of underweight (moderate and severe)--Percent, Total < 5 yr., kml
- Primary Completion Rate, Rate, Total, kml
- Proportion of 1 year-old children immunised against measles, Percent, Total 1 yr., kml
- Proportion of births attended by skilled health personnel, Percent, Total, kml
- Proportion of population with access to improved sanitation, Percent, Total, kml
- Proportion of population with sustainable access to an improved water source, Percent, Total, kml
- Under-five mortality rate, Deaths per 1000 live births, Total, kml

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SECTION 5: GOOGLE EARTH

Figure 5.1: The goal of this sequence of images is to show the reader one way to edit files in Google Earth so that coplanar polygons are eliminated.

Figure 5.2: The goal of this sequence of images is to show the reader one way to save files in Google Earth so that they appear in Google Earth when it is opened again after having been shut down.

Figure 5.3: The goal of this sequence of images is to suggest other ways to edit and save files in Google Earth so that they appear in Google Earth when it is opened again after having been shut down.

Figure 5.4: The goal of this sequence of images is to show how to open a kml file directly in Google Earth. In previous Figures, Google Earth Pro was launched. Here, the free Google Earth is used. The strategy for opening files is the same in either version.

RESULTANT FILES:

- Maternal mortality ratio, edited kml
- Prevalence of underweight (moderate and severe)--Percent, Total < 5 yr., edited kml
- Primary Completion Rate, Rate, Total, edited kml
- Proportion of 1 year-old children immunised against measles, Percent, Total 1 yr., edited kml
- Proportion of births attended by skilled health personnel, Percent, Total, edited kml
- Proportion of population with access to improved sanitation, Percent, Total, edited kml

- **Proportion of population with sustainable access to an improved water source, Percent, Total, edited kml**
- **Under-five mortality rate, Deaths per 1000 live births, Total, edited kml**

SECTION 1: DEV INFO

In this software package, a "right-click" on the mouse (on a PC) often brings up extra information and opportunity for software use. Currently, it is in use in 81 developing nations. For further information about this software, developed by Kris S. Oswalt and team, see http://www.CommunitySystemsFoundation.org/

FIGURE 1.1: Link to sequence of static shots composing this animation. The goal here is to show the reader how to launch the DevInfo software, an associated database, and a set of indicators from the database.

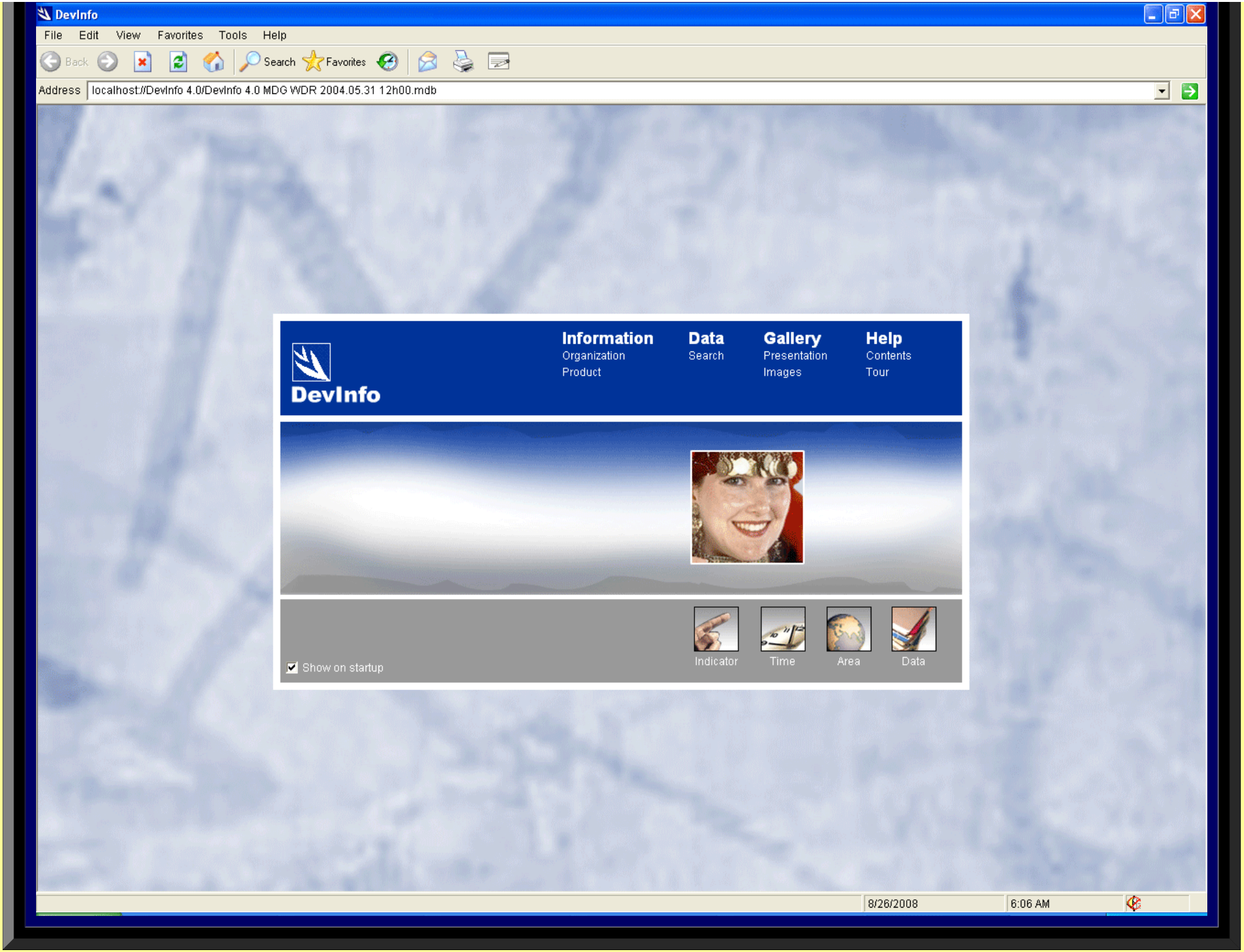
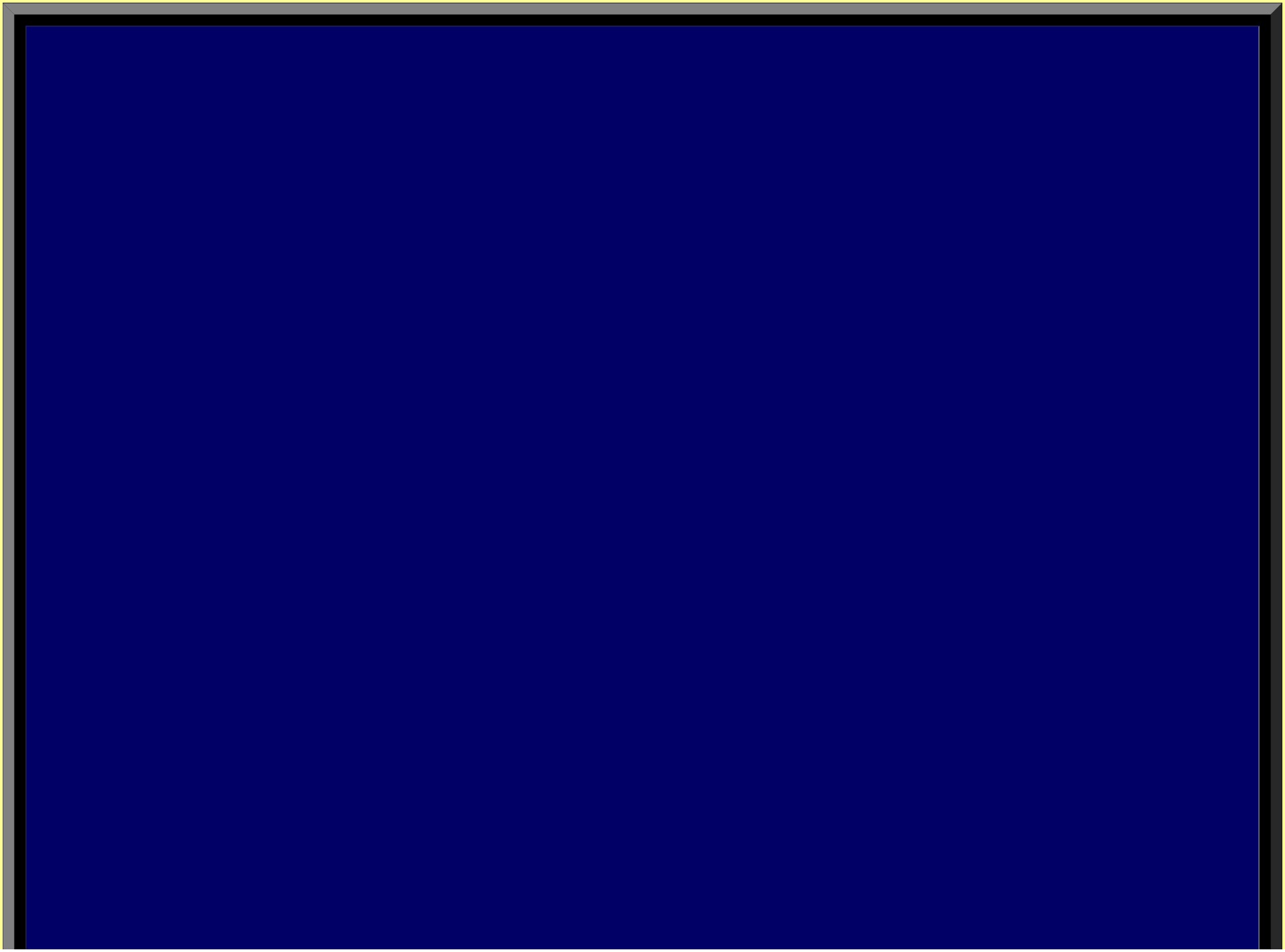

DevInfo
File Edit View Favorites Tools Help
Back Search Favorites
Address localhost://DevInfo 4.0/DevInfo 4.0 MDG WDR 2004.05.31 12h00.mdb
DevInfo
Information
Organization
Product
Data
Search
Gallery
Presentation
Images
Help
Contents
Tour
Show on startup
Indicator
Time
Area
Data
8/26/2008
6:06 AM

FIGURE 1.2: Link to sequence of static shots composing this animation. The goal here is to show the reader how to select time frames for analysis.



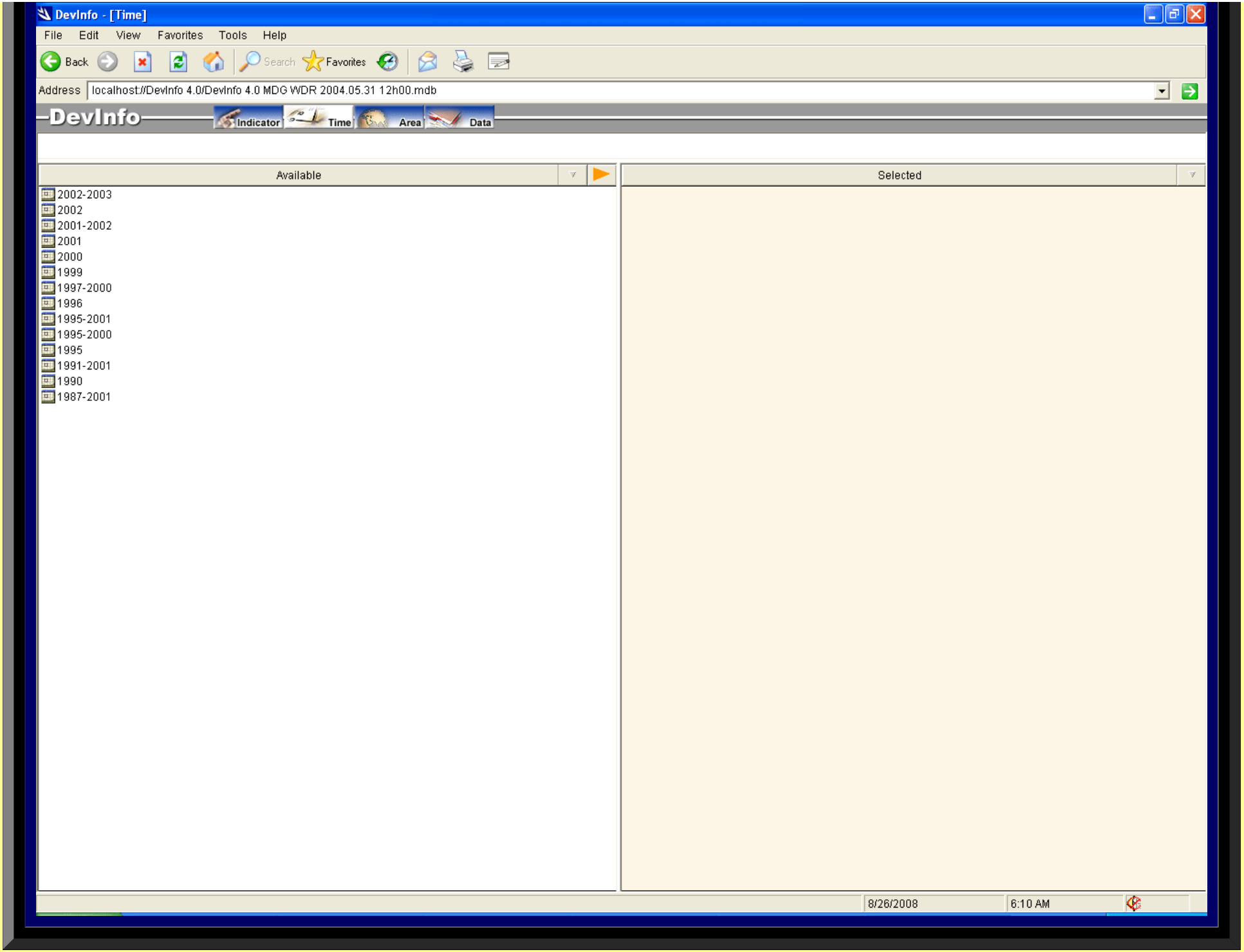
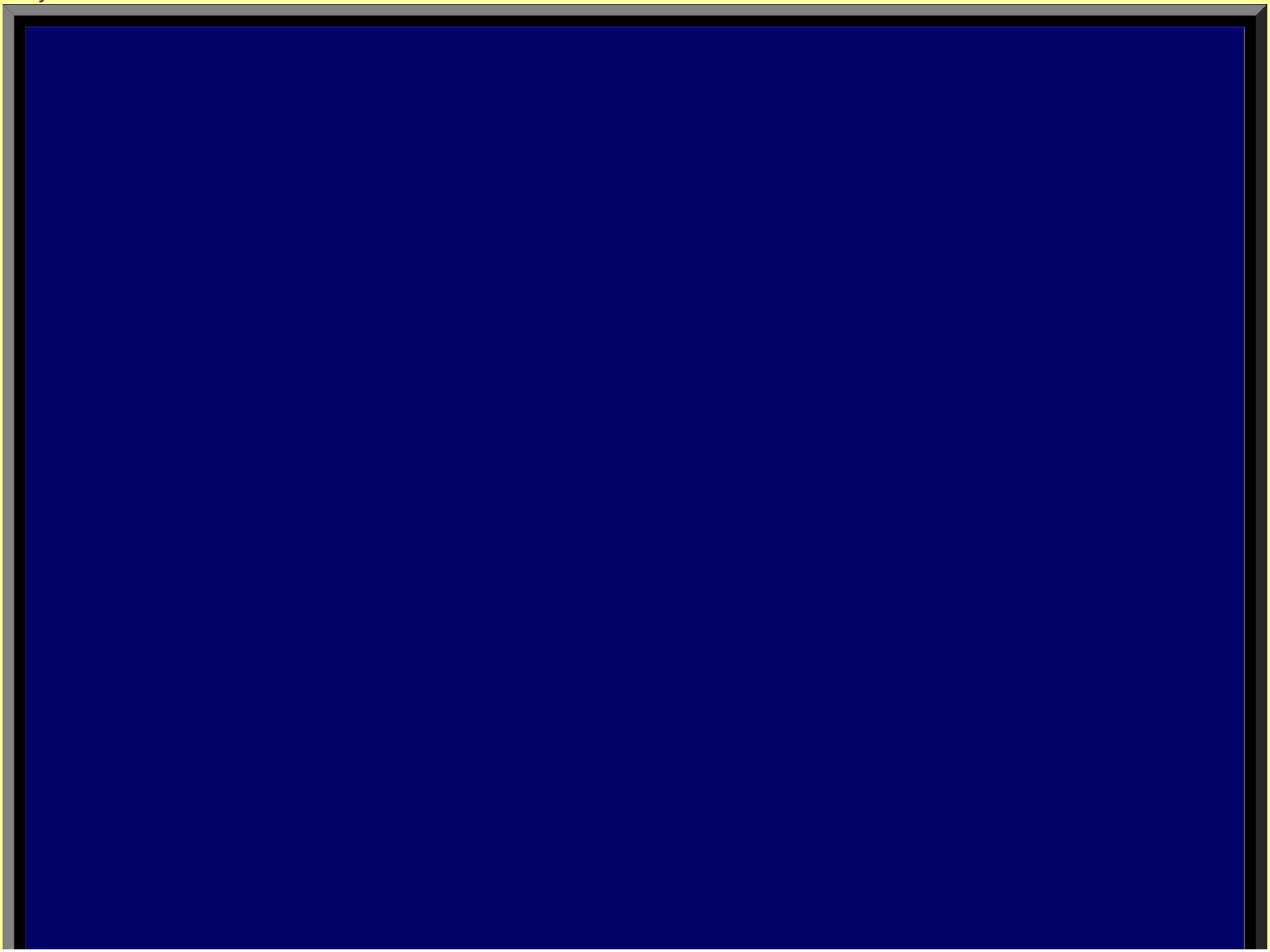

DevInfo - [Time]
File Edit View Favorites Tools Help
Back Search Favorites
Address localhost://DevInfo 4.0/DevInfo 4.0 MDG WDR 2004.05.31 12h00.mdb
DevInfo
Indicator Time Area Data
Available
2002-2003
2002
2001-2002
2001
2000
1999
1997-2000
1996
1995-2001
1995-2000
1995
1991-2001
1990
1987-2001
Selected
8/26/2008
6:10 AM

FIGURE 1.3: Link to sequence of static shots composing this animation. The goal here is to show the reader how to select geographic regions for analysis.



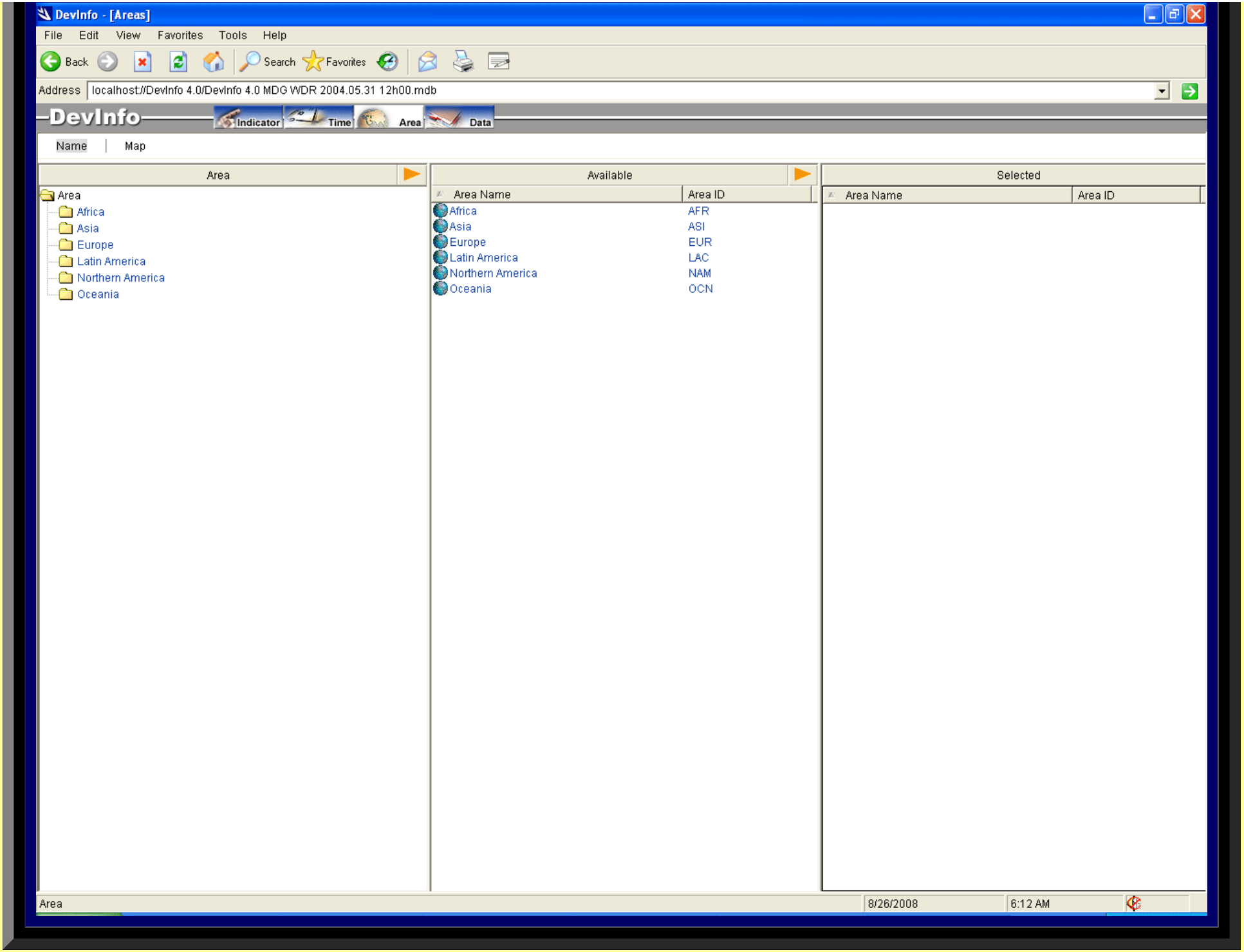
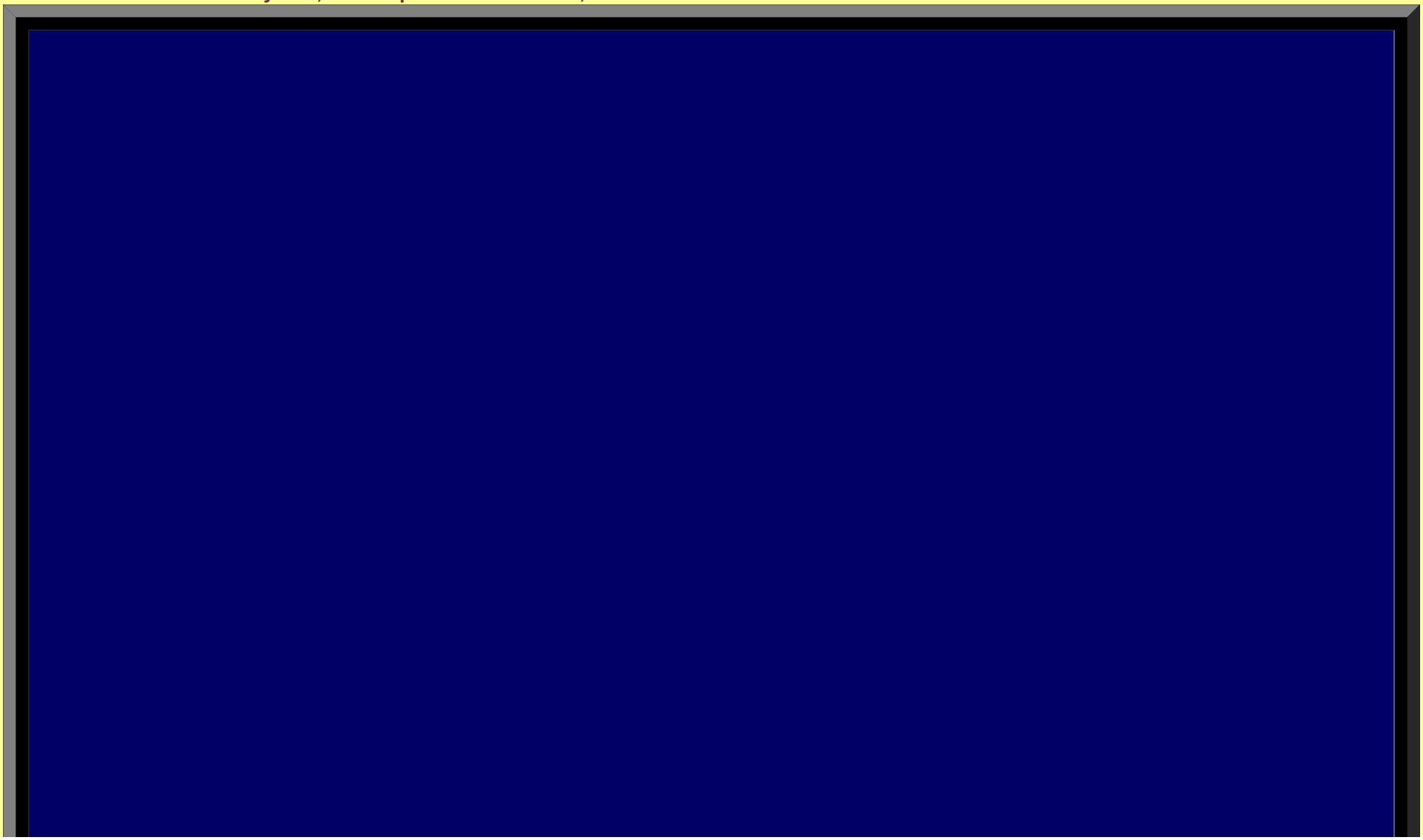
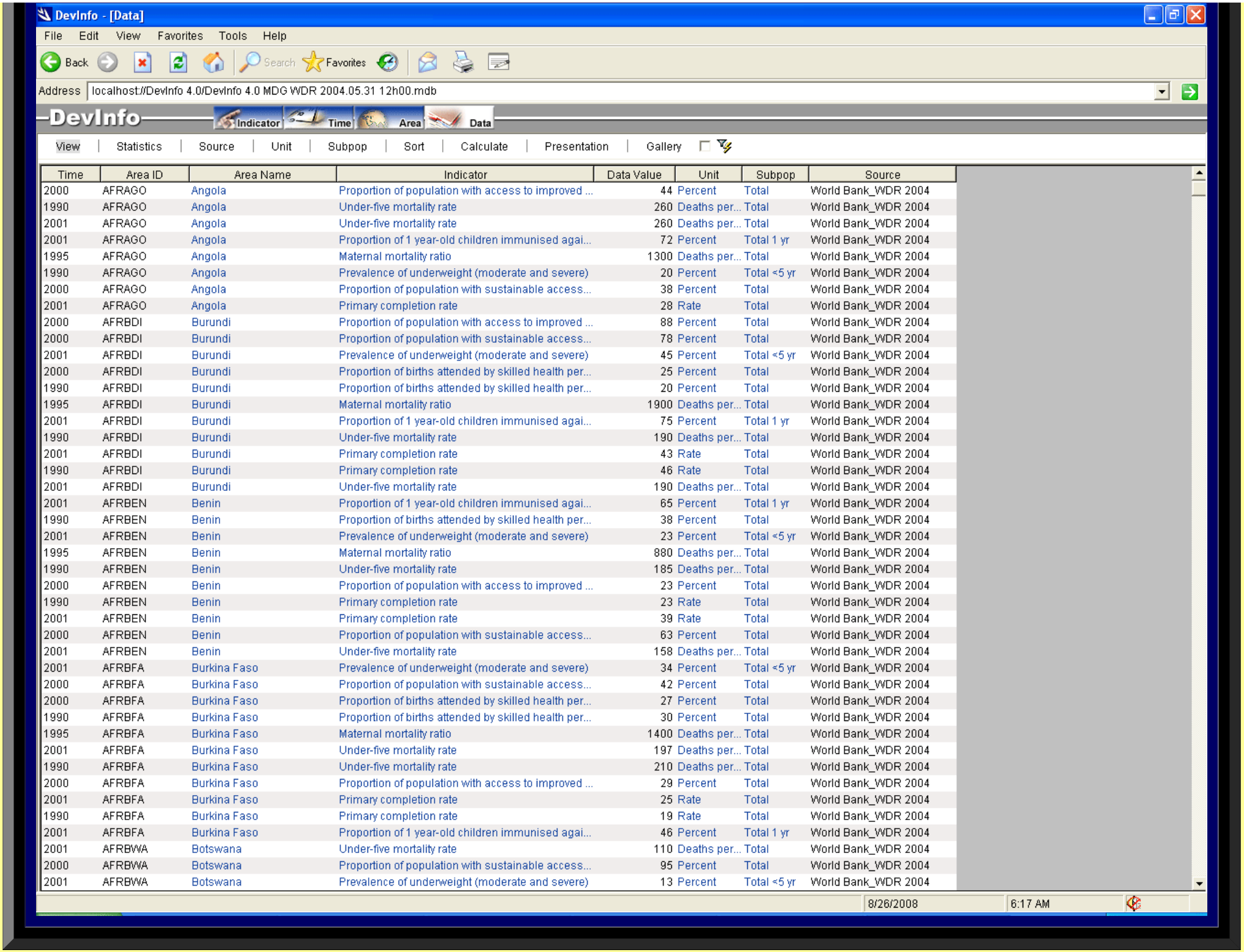

DevInfo - [Areas]
File Edit View Favorites Tools Help
Back Search Favorites
Address localhost://DevInfo 4.0/DevInfo 4.0 MDG WDR 2004.05.31 12h00.mdb
DevInfo
Indicator Time Area Data
Name Map
Area
Area
Africa
Asia
Europe
Latin America
Northern America
Oceania
Available
Area Name Area ID
Africa AFR
Asia ASI
Europe EUR
Latin America LAC
Northern America NAM
Oceania OCN
Selected
Area Name Area ID
Area 8/26/2008 6:12 AM

FIGURE 1.4: Link to sequence of static shots composing this animation. The goal here is to display the data selected for analysis of all indicators from Africa. Data is displayed both by country name and by indicator name. The latter display lets the user easily see which indicators have data associated with them. In this case, there are 8 different indicators:

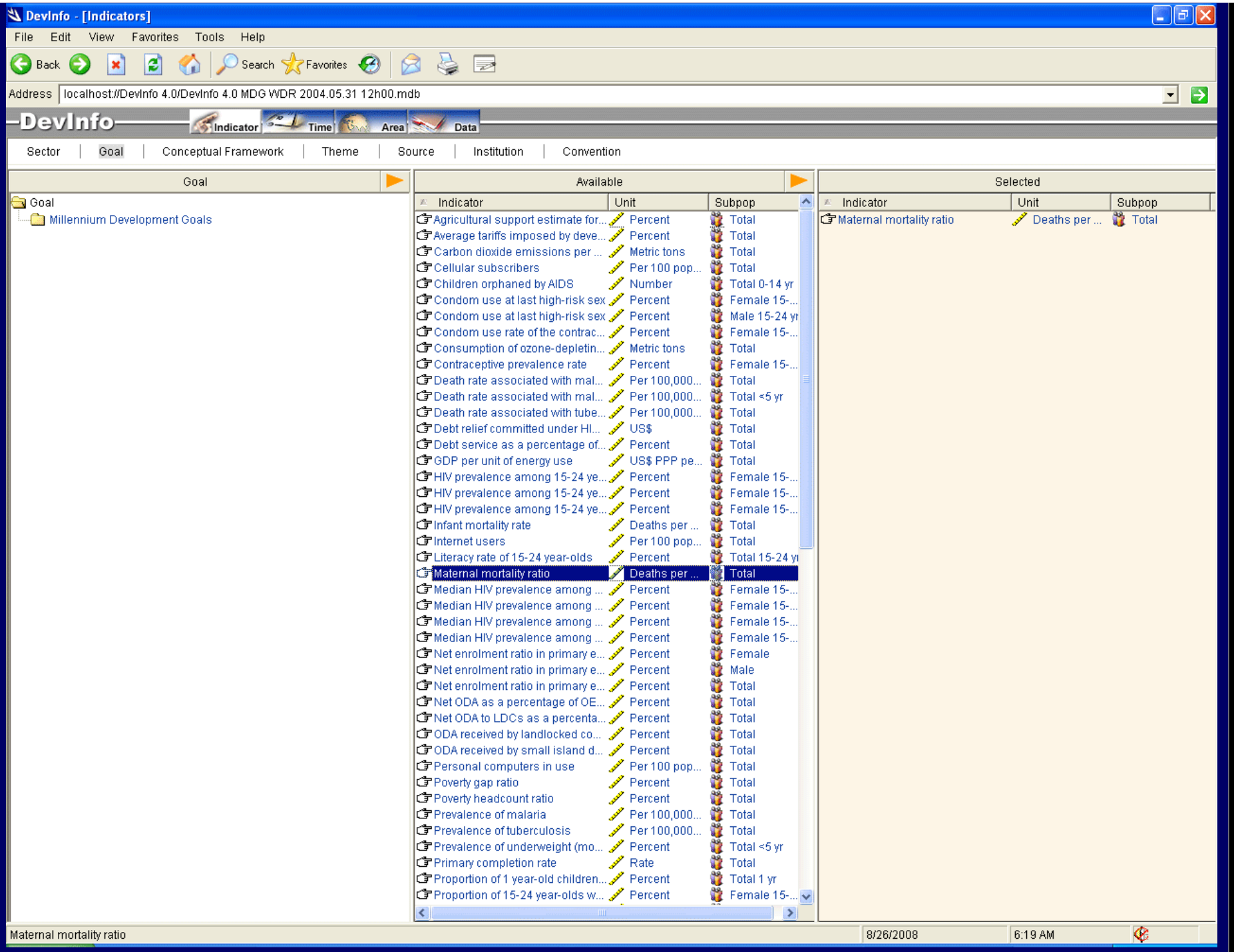
Maternal mortality ratio
Prevalence of underweight (moderate and severe)--Percent, Total < 5 yr.
Primary Completion Rate, Rate, Total
Proportion of 1 year-old children immunised against measles, Percent, Total 1 yr
Proportion of births attended by skilled health personnel, Percent, Total
Proportion of population with access to improved sanitation, Percent, Total
Proportion of population with sustainable access to an improved water source, Percent, Total
Under-five mortality rate, Deaths per 1000 live births, Total





Time	Area ID	Area Name	Indicator	Data Value	Unit	Subpop	Source
2000	AFRAGO	Angola	Proportion of population with access to improved ...	44	Percent	Total	World Bank_WDR 2004
1990	AFRAGO	Angola	Under-five mortality rate	260	Deaths per...	Total	World Bank_WDR 2004
2001	AFRAGO	Angola	Under-five mortality rate	260	Deaths per...	Total	World Bank_WDR 2004
2001	AFRAGO	Angola	Proportion of 1 year-old children immunised agai...	72	Percent	Total 1 yr	World Bank_WDR 2004
1995	AFRAGO	Angola	Maternal mortality ratio	1300	Deaths per...	Total	World Bank_WDR 2004
1990	AFRAGO	Angola	Prevalence of underweight (moderate and severe)	20	Percent	Total <5 yr	World Bank_WDR 2004
2000	AFRAGO	Angola	Proportion of population with sustainable access...	38	Percent	Total	World Bank_WDR 2004
2001	AFRAGO	Angola	Primary completion rate	28	Rate	Total	World Bank_WDR 2004
2000	AFRBDI	Burundi	Proportion of population with access to improved ...	88	Percent	Total	World Bank_WDR 2004
2000	AFRBDI	Burundi	Proportion of population with sustainable access...	78	Percent	Total	World Bank_WDR 2004
2001	AFRBDI	Burundi	Prevalence of underweight (moderate and severe)	45	Percent	Total <5 yr	World Bank_WDR 2004
2000	AFRBDI	Burundi	Proportion of births attended by skilled health per...	25	Percent	Total	World Bank_WDR 2004
1990	AFRBDI	Burundi	Proportion of births attended by skilled health per...	20	Percent	Total	World Bank_WDR 2004
1995	AFRBDI	Burundi	Maternal mortality ratio	1900	Deaths per...	Total	World Bank_WDR 2004
2001	AFRBDI	Burundi	Proportion of 1 year-old children immunised agai...	75	Percent	Total 1 yr	World Bank_WDR 2004
1990	AFRBDI	Burundi	Under-five mortality rate	190	Deaths per...	Total	World Bank_WDR 2004
2001	AFRBDI	Burundi	Primary completion rate	43	Rate	Total	World Bank_WDR 2004
1990	AFRBDI	Burundi	Primary completion rate	46	Rate	Total	World Bank_WDR 2004
2001	AFRBDI	Burundi	Under-five mortality rate	190	Deaths per...	Total	World Bank_WDR 2004
2001	AFRBEN	Benin	Proportion of 1 year-old children immunised agai...	65	Percent	Total 1 yr	World Bank_WDR 2004
1990	AFRBEN	Benin	Proportion of births attended by skilled health per...	38	Percent	Total	World Bank_WDR 2004
2001	AFRBEN	Benin	Prevalence of underweight (moderate and severe)	23	Percent	Total <5 yr	World Bank_WDR 2004
1995	AFRBEN	Benin	Maternal mortality ratio	880	Deaths per...	Total	World Bank_WDR 2004
1990	AFRBEN	Benin	Under-five mortality rate	185	Deaths per...	Total	World Bank_WDR 2004
2000	AFRBEN	Benin	Proportion of population with access to improved ...	23	Percent	Total	World Bank_WDR 2004
1990	AFRBEN	Benin	Primary completion rate	23	Rate	Total	World Bank_WDR 2004
2001	AFRBEN	Benin	Primary completion rate	39	Rate	Total	World Bank_WDR 2004
2000	AFRBEN	Benin	Proportion of population with sustainable access...	63	Percent	Total	World Bank_WDR 2004
2001	AFRBEN	Benin	Under-five mortality rate	158	Deaths per...	Total	World Bank_WDR 2004
2001	AFRBFA	Burkina Faso	Prevalence of underweight (moderate and severe)	34	Percent	Total <5 yr	World Bank_WDR 2004
2000	AFRBFA	Burkina Faso	Proportion of population with sustainable access...	42	Percent	Total	World Bank_WDR 2004
2000	AFRBFA	Burkina Faso	Proportion of births attended by skilled health per...	27	Percent	Total	World Bank_WDR 2004
1990	AFRBFA	Burkina Faso	Proportion of births attended by skilled health per...	30	Percent	Total	World Bank_WDR 2004
1995	AFRBFA	Burkina Faso	Maternal mortality ratio	1400	Deaths per...	Total	World Bank_WDR 2004
2001	AFRBFA	Burkina Faso	Under-five mortality rate	197	Deaths per...	Total	World Bank_WDR 2004
1990	AFRBFA	Burkina Faso	Under-five mortality rate	210	Deaths per...	Total	World Bank_WDR 2004
2000	AFRBFA	Burkina Faso	Proportion of population with access to improved ...	29	Percent	Total	World Bank_WDR 2004
2001	AFRBFA	Burkina Faso	Primary completion rate	25	Rate	Total	World Bank_WDR 2004
1990	AFRBFA	Burkina Faso	Primary completion rate	19	Rate	Total	World Bank_WDR 2004
2001	AFRBFA	Burkina Faso	Proportion of 1 year-old children immunised agai...	46	Percent	Total 1 yr	World Bank_WDR 2004
2001	AFRBWA	Botswana	Under-five mortality rate	110	Deaths per...	Total	World Bank_WDR 2004
2000	AFRBWA	Botswana	Proportion of population with sustainable access...	95	Percent	Total	World Bank_WDR 2004
2001	AFRBWA	Botswana	Prevalence of underweight (moderate and severe)	13	Percent	Total <5 yr	World Bank_WDR 2004

FIGURE 1.5: Link to sequence of static shots composing this animation. Here the reader is taken through an entire sequence of steps for extracting data for a single indicator and making a map from it. The map is exported to ArcView .apr format to be opened in the next stage in ArcView 3.x. Repeat this process for each indicator for which there is data.



RESULTANT FILES:

- **Maternal mortality ratio, raw .apr**
- **Prevalence of underweight (moderate and severe)--Percent, Total < 5 yr., raw .apr**
- **Primary Completion Rate, Rate, Total, raw .apr**
- **Proportion of 1 year-old children immunised against measles, Percent, Total 1 yr., raw .apr**
- **Proportion of births attended by skilled health personnel, Percent, Total, raw .apr**
- **Proportion of population with access to improved sanitation, Percent, Total, raw .apr**
- **Proportion of population with sustainable access to an improved water source, Percent, Total, raw .apr**
- **Under-five mortality rate, Deaths per 1000 live births, Total, raw .apr**

SECTION 2: ARC VIEW 3.2/3.3

This software is Geographic Information System (GIS) software. The importance of GIS is that maps and databases function in an interactive mode: a change in the data produces a corresponding change on the map and vice-versa. Thus, the process of mapping is transformed from a static one to a dynamic one. This particular package, developed by ESRI, is currently in use in many developing nations although not still commonly in use in the U.S.A. and other locales.

FIGURE 2.1: Link to sequence of static shots composing this animation. The goal of this sequence of images is to show the reader how to open, in ArcView 3.2/3.3, one of the raw .apr files created in DevInfo.

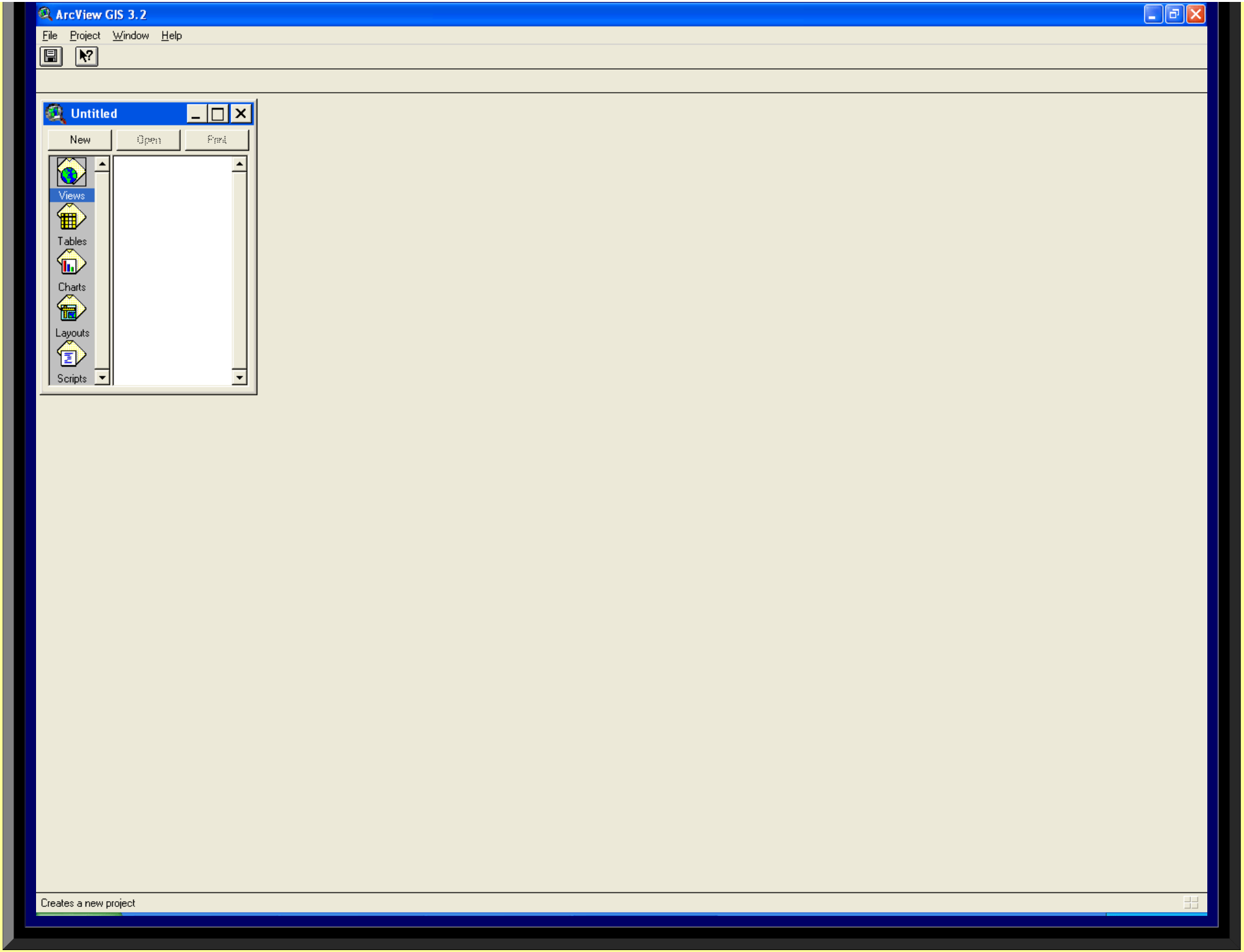
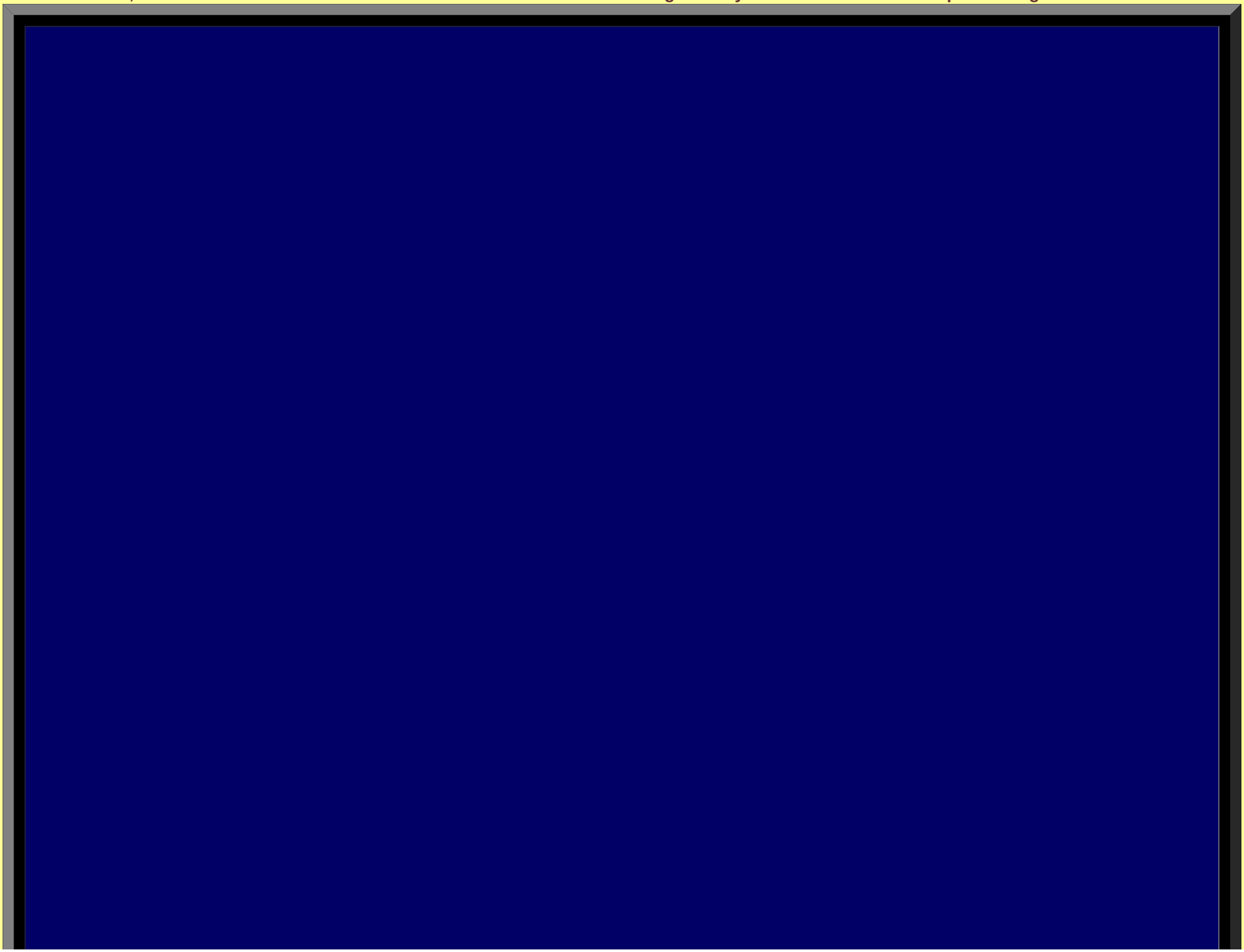
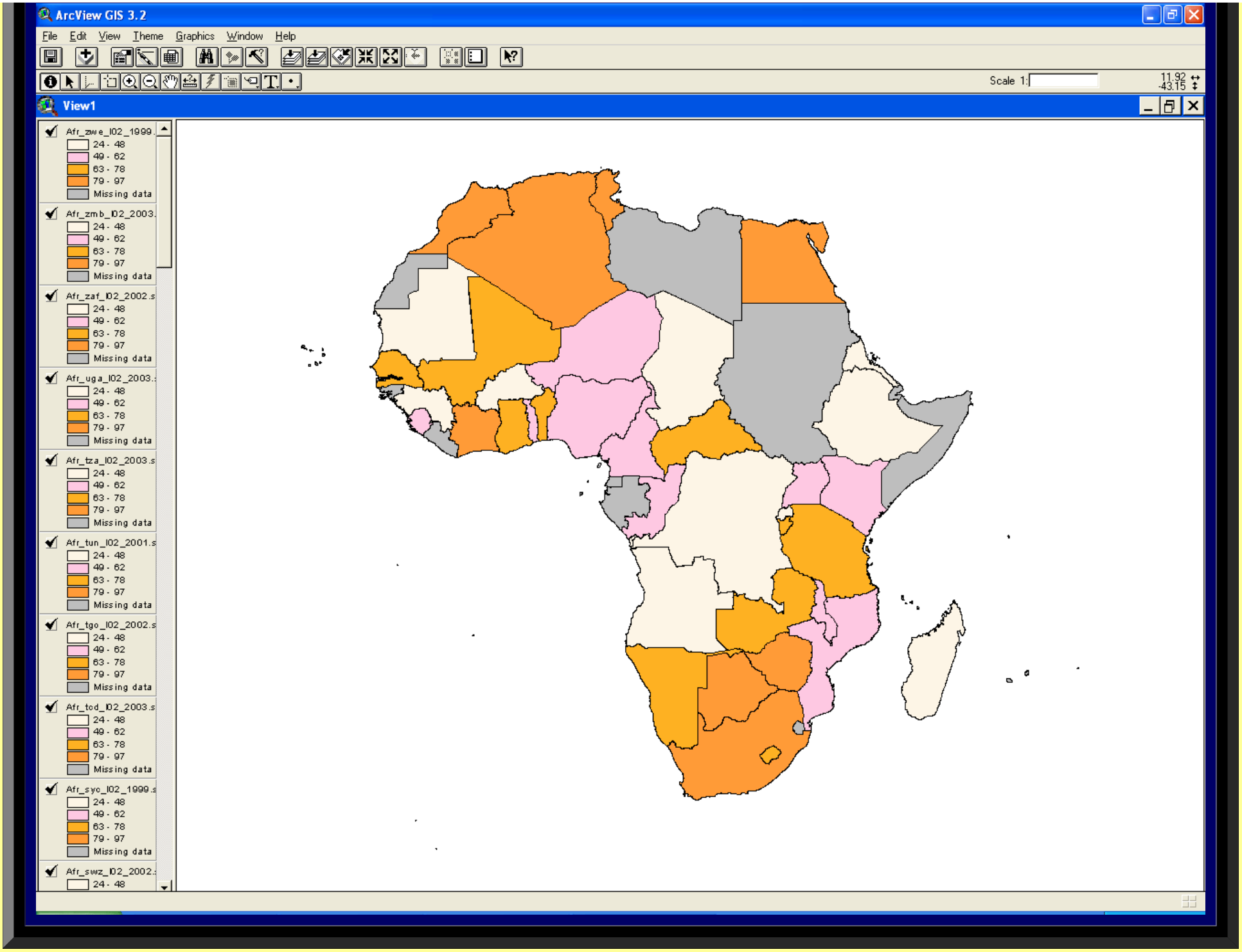

ArcView GIS 3.2
File
Project
Window
Help
Untitled
New
Open
Find
Views
Tables
Charts
Layouts
Scripts
Creates a new project

FIGURE 2.2: Link to sequence of static shots composing this animation. The goal of this sequence of images is to show the reader how to launch, in ArcView 3.2/3.3, extensions to ArcView. One is selected that will be used to merge the layers. It is called the "Geoprocessing" extension.




ArcView GIS 3.2
File Edit View Theme Graphics Window Help
Scale 1:
11.92
-43.15
View1
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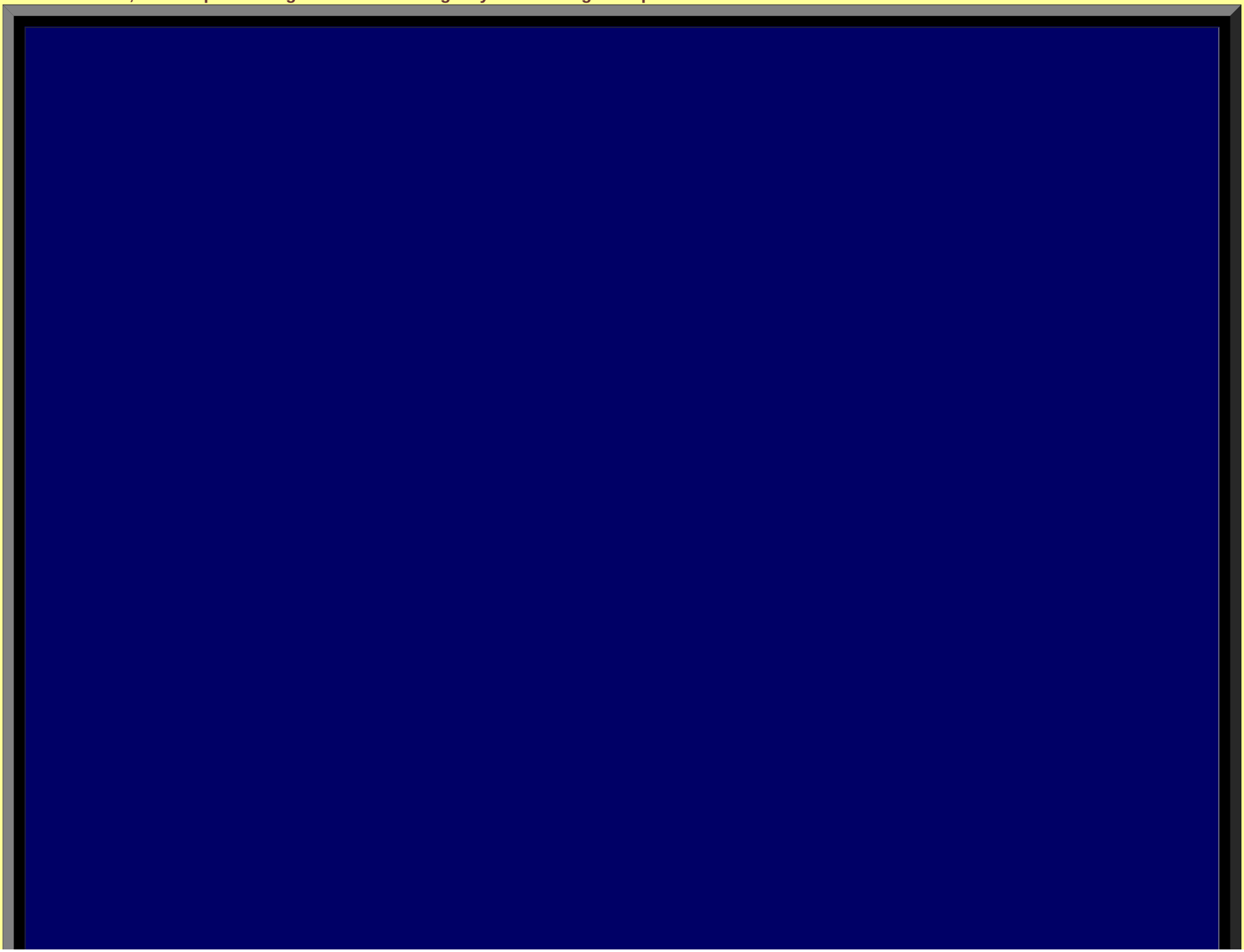
Afr_zmb_l02_2003.
Afr_zaf_l02_2002.s
Afr_uga_l02_2003.s
Afr_tza_l02_2003.s
Afr_tun_l02_2001.s
Afr_tgo_l02_2002.s
Afr_tcd_l02_2003.s
Afr_syc_l02_1999.s
Afr_swz_l02_2002.s
24 - 48
49 - 62
63 - 78
79 - 97
Missing data

FIGURE 2.3: Link to sequence of static shots composing this animation. The goal of this sequence of images is to show the reader how to use, in ArcView 3.2/3.3, the Geoprocessing extension to merge layers to a single shape file.



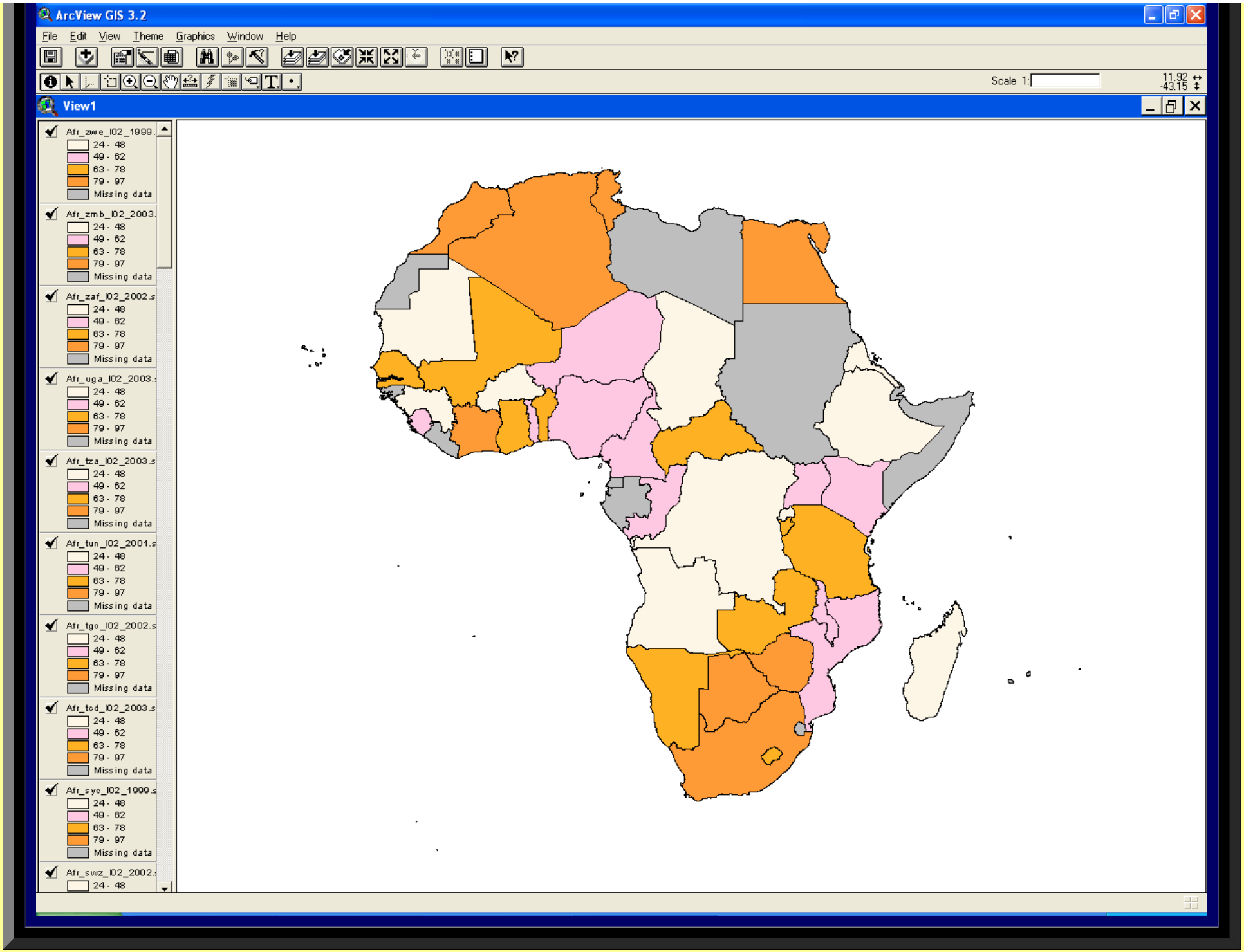
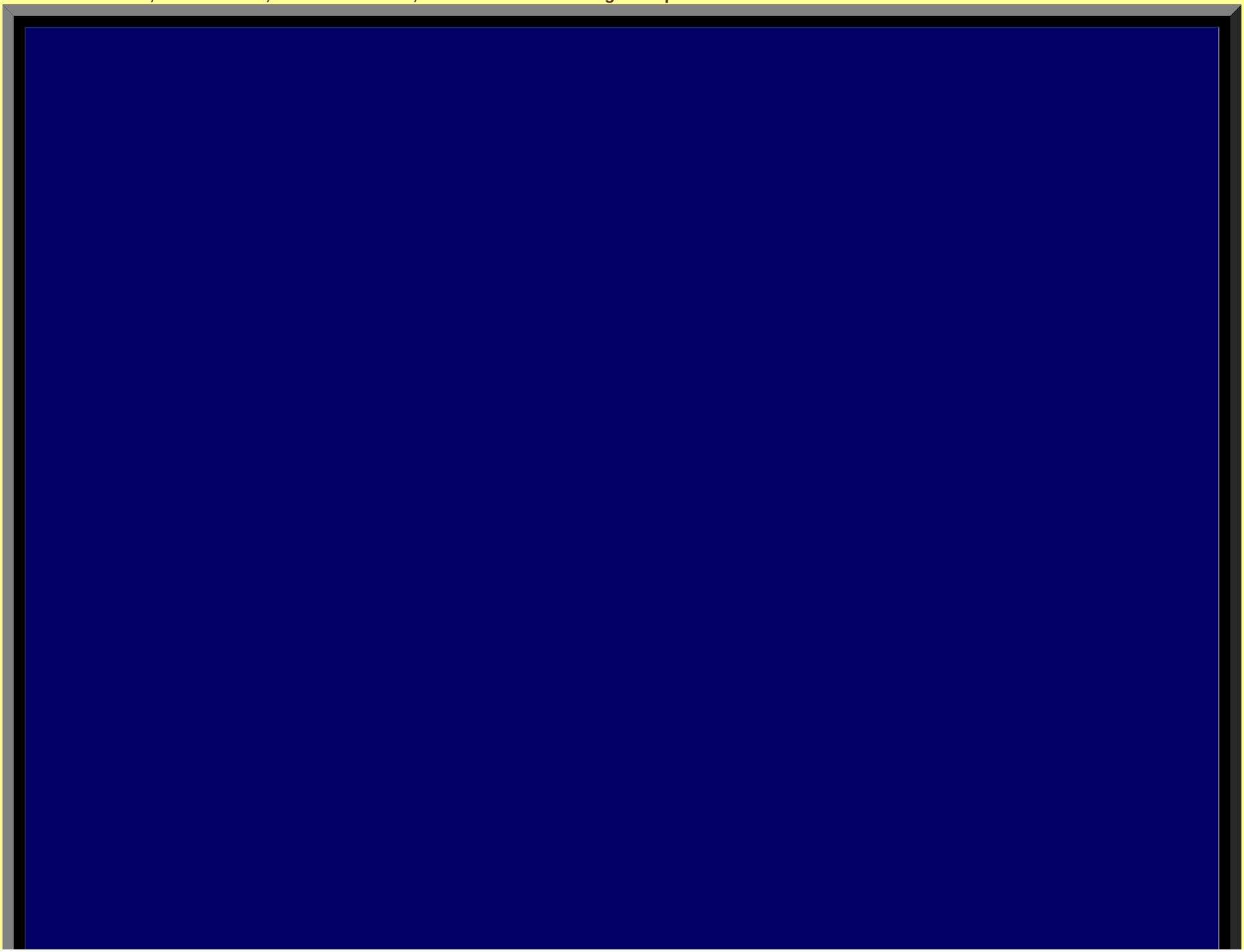
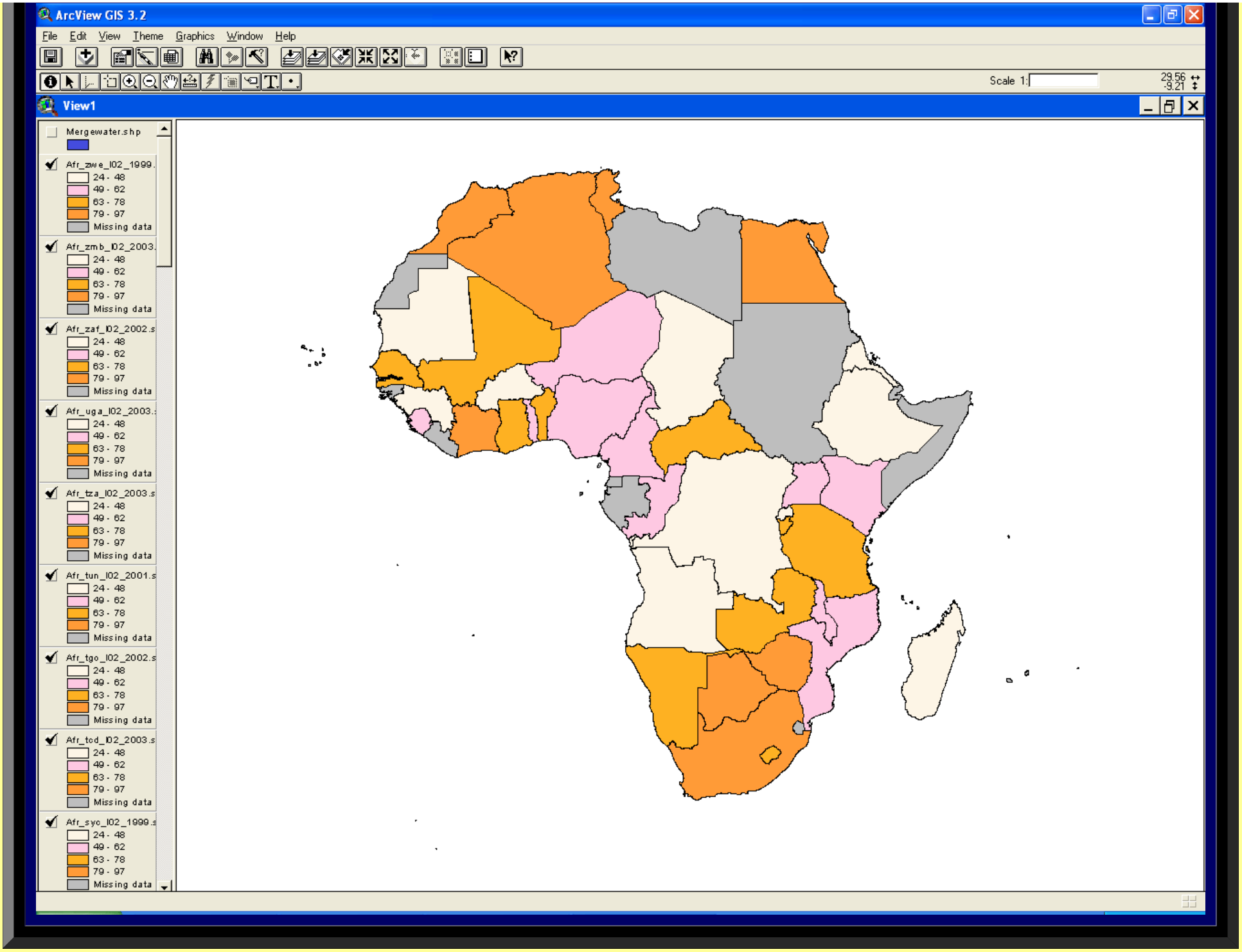

ArcView GIS 3.2
File Edit View Theme Graphics Window Help
Scale 1:
11.92
-43.15
View1
Afr_zwe_l02_1999.
Afr_zmb_l02_2003.
Afr_zaf_l02_2002.s
Afr_uga_l02_2003.
Afr_tza_l02_2003.s
Afr_tun_l02_2001.s
Afr_tgo_l02_2002.s
Afr_tcd_l02_2003.s
Afr_syc_l02_1999.s
Afr_swz_l02_2002.
24 - 48
49 - 62
63 - 78
79 - 97
Missing data

FIGURE 2.4: Link to sequence of static shots composing this animation. The goal of this sequence of images is to show the reader how to retrieve, in ArcView 3.2/3.3, the database, or "Attribute File," associated with a single shape file.




ArcView GIS 3.2
File Edit View Theme Graphics Window Help
Scale 1:
29.56
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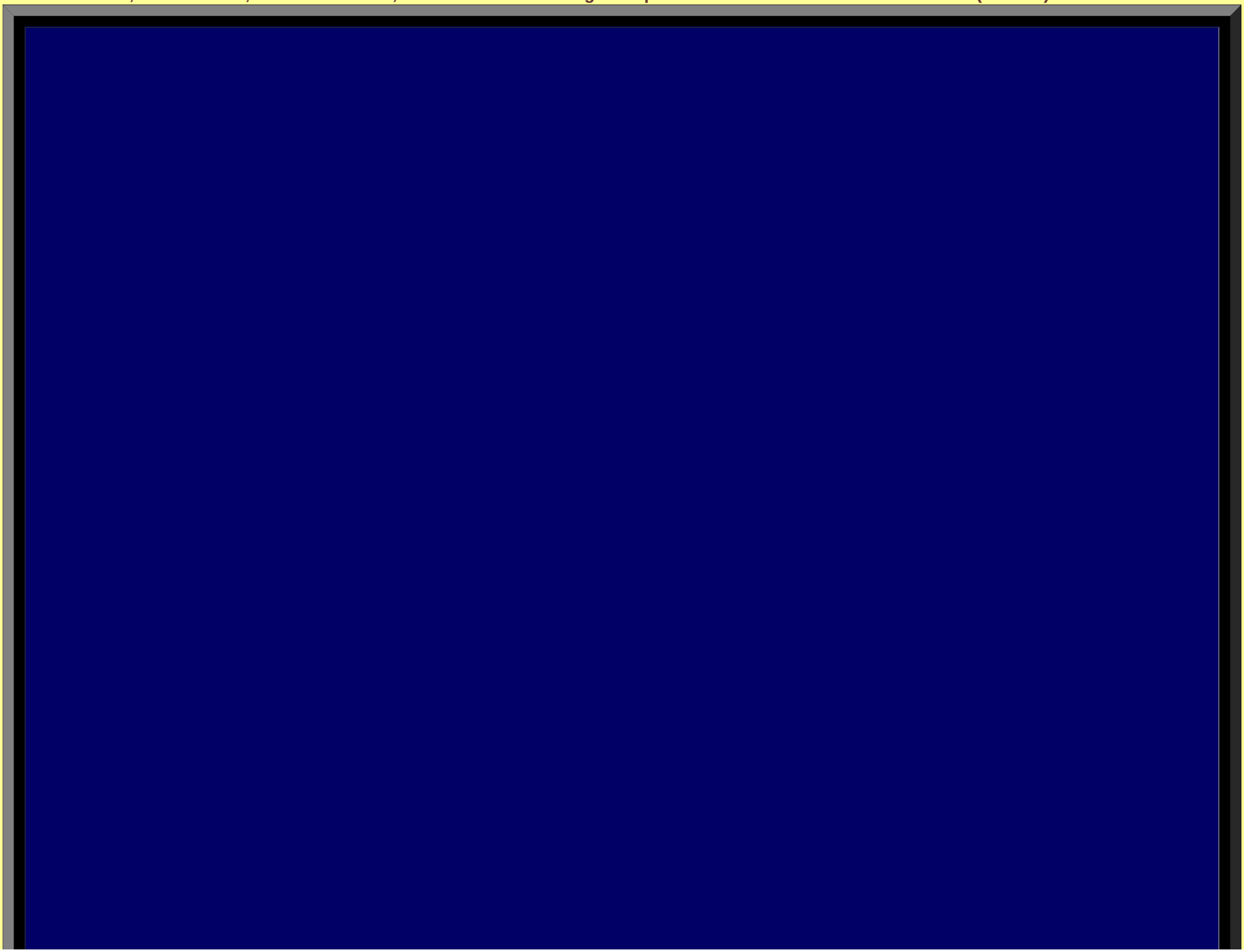
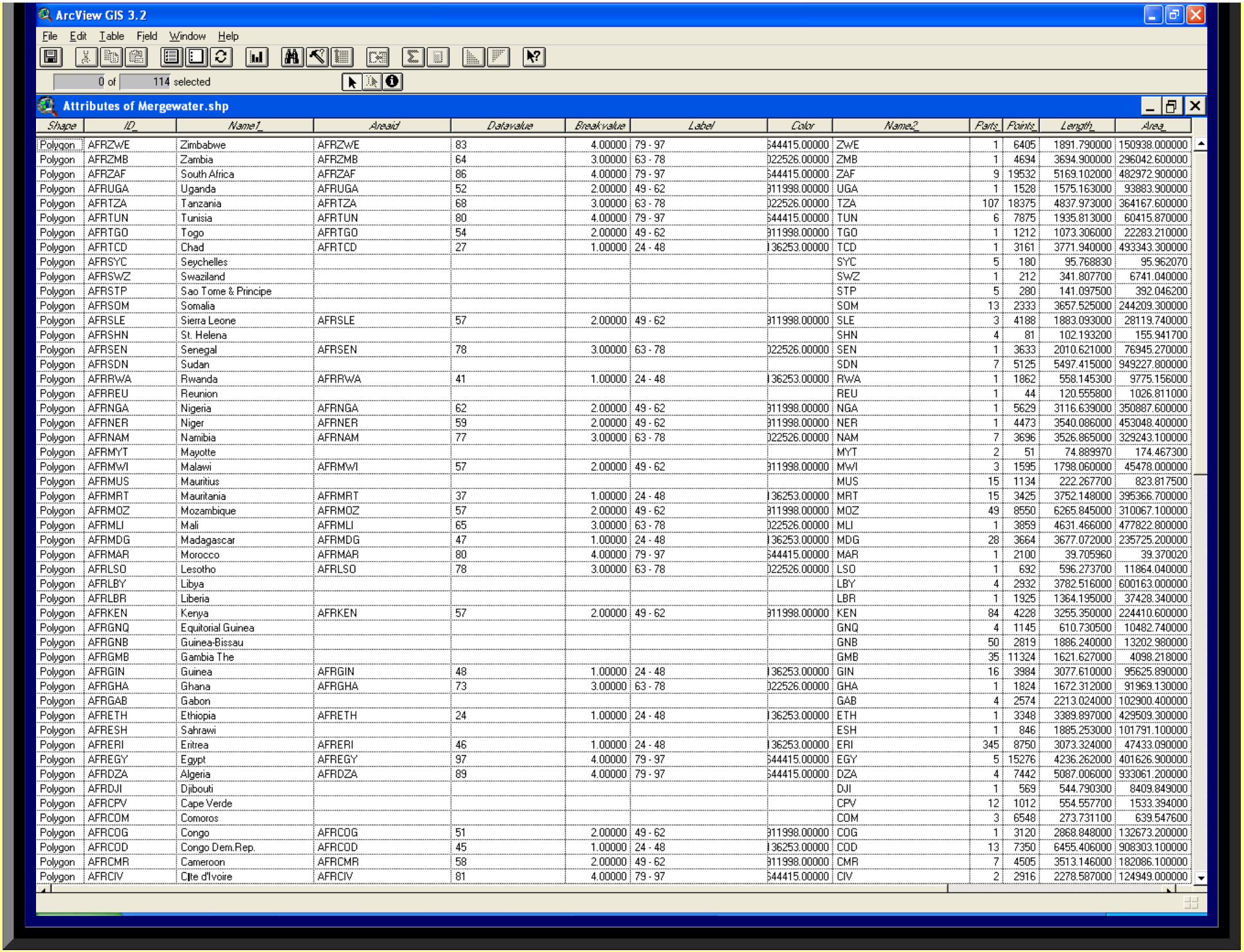
View1
Mergewater.shp
Afr_zwe_I02_1999.
24 - 48
49 - 62
63 - 78
79 - 97
Missing data
Afr_zmb_I02_2003.
Afr_zaf_I02_2002.s
Afr_uga_I02_2003.
Afr_tza_I02_2003.s
Afr_tun_I02_2001.s
Afr_tgo_I02_2002.s
Afr_tcd_I02_2003.s
Afr_syc_I02_1999.s

FIGURE 2.5: Link to sequence of static shots composing this animation. The goal of this sequence of images is to show the reader how to edit, in ArcView 3.2/3.3, the database, or "Attribute File," associated with a single shape file and to add a new blank data field (column).





ArcView GIS 3.2

File Edit Table Field Window Help

0 of 114 selected

Attributes of Mergewater.shp

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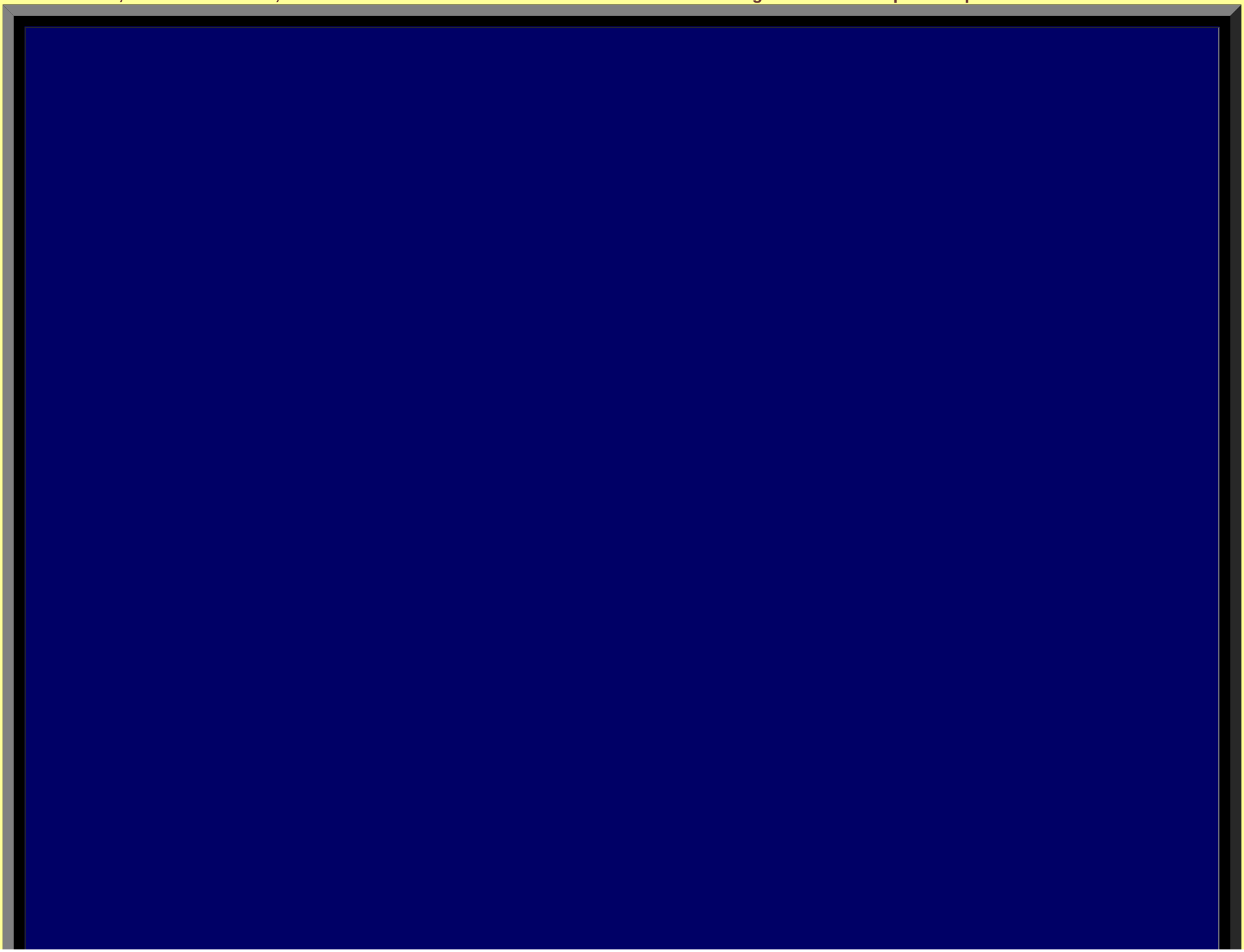
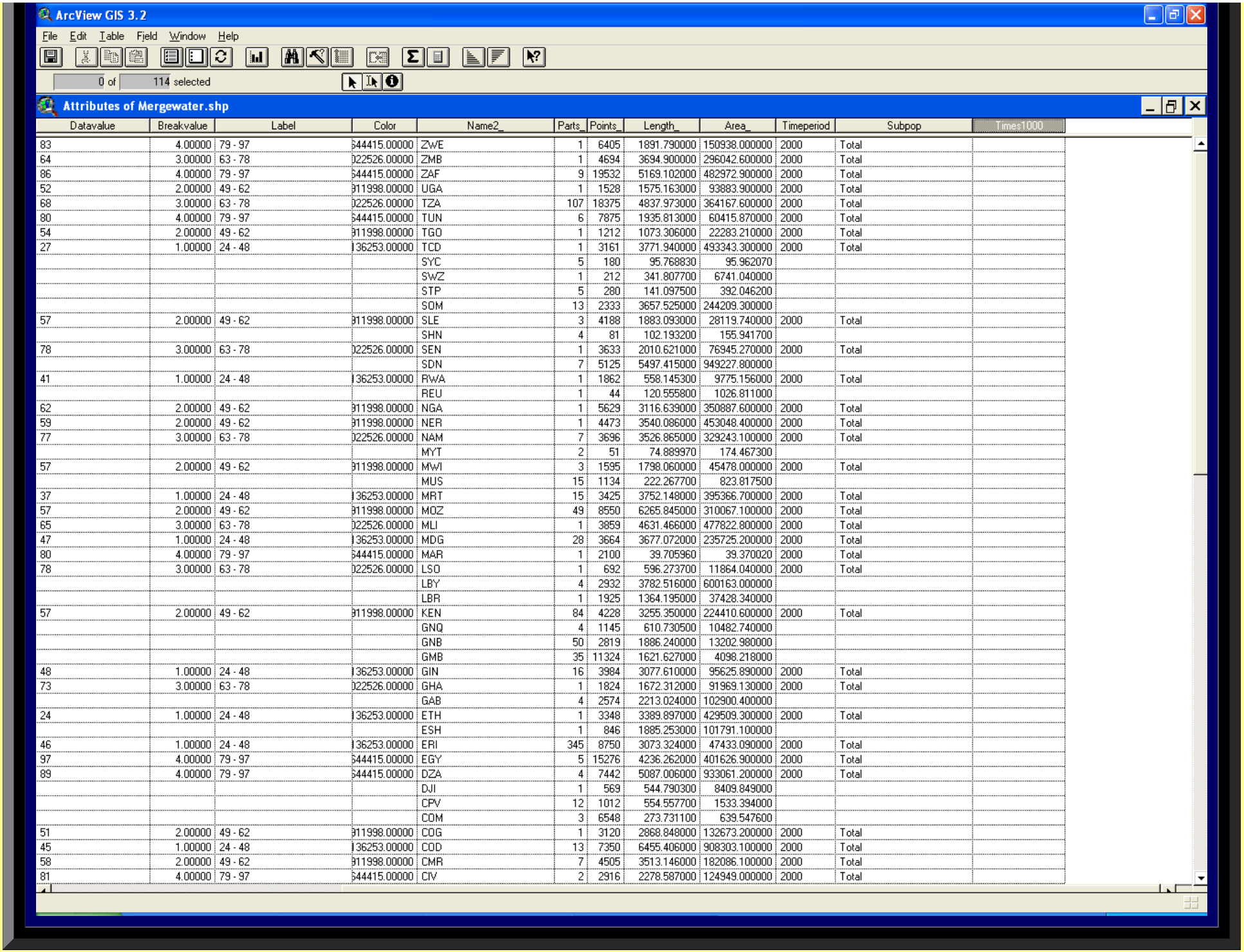
Polygon	AFRZWE	Zimbabwe	AFRZWE	83	4.00000	79 - 97	544415.00000	ZWE	1	6405	1891.790000	150938.000000
Polygon	AFRZMB	Zambia	AFRZMB	64	3.00000	63 - 78	022526.00000	ZMB	1	4694	3694.900000	296042.600000
Polygon	AFRZAF	South Africa	AFRZAF	86	4.00000	79 - 97	544415.00000	ZAF	9	19532	5169.102000	482972.900000
Polygon	AFRUGA	Uganda	AFRUGA	52	2.00000	49 - 62	911998.00000	UGA	1	1528	1575.163000	93883.900000
Polygon	AFRTZA	Tanzania	AFRTZA	68	3.00000	63 - 78	022526.00000	TZA	107	18375	4837.973000	364167.600000
Polygon	AFRTUN	Tunisia	AFRTUN	80	4.00000	79 - 97	544415.00000	TUN	6	7875	1935.813000	60415.870000
Polygon	AFRTGO	Togo	AFRTGO	54	2.00000	49 - 62	911998.00000	TGO	1	1212	1073.306000	22283.210000
Polygon	AFRTCD	Chad	AFRTCD	27	1.00000	24 - 48	136253.00000	TCD	1	3161	3771.940000	493343.300000
Polygon	AFRSYC	Seychelles						SYC	5	180	95.768830	95.962070
Polygon	AFRSWZ	Swaziland						SWZ	1	212	341.807700	6741.040000
Polygon	AFRSTP	Sao Tome & Principe						STP	5	280	141.097500	392.046200
Polygon	AFRSOM	Somalia						SOM	13	2333	3657.525000	244209.300000
Polygon	AFRSLE	Sierra Leone	AFRSLE	57	2.00000	49 - 62	911998.00000	SLE	3	4188	1883.093000	28119.740000
Polygon	AFRSHN	St. Helena						SHN	4	81	102.193200	155.941700
Polygon	AFRSEN	Senegal	AFRSEN	78	3.00000	63 - 78	022526.00000	SEN	1	3633	2010.621000	76945.270000
Polygon	AFRSDN	Sudan						SDN	7	5125	5497.415000	949227.800000
Polygon	AFRRWA	Rwanda	AFRRWA	41	1.00000	24 - 48	136253.00000	RWA	1	1862	558.145300	9775.156000
Polygon	AFRREU	Reunion						REU	1	44	120.555800	1026.811000
Polygon	AFRNGA	Nigeria	AFRNGA	62	2.00000	49 - 62	911998.00000	NGA	1	5629	3116.639000	350887.600000
Polygon	AFRNER	Niger	AFRNER	59	2.00000	49 - 62	911998.00000	NER	1	4473	3540.086000	453048.400000
Polygon	AFRNAM	Namibia	AFRNAM	77	3.00000	63 - 78	022526.00000	NAM	7	3696	3526.865000	329243.100000
Polygon	AFRMYT	Mayotte						MYT	2	51	74.889970	174.467300
Polygon	AFRMWI	Malawi	AFRMWI	57	2.00000	49 - 62	911998.00000	MWI	3	1595	1798.060000	45478.000000
Polygon	AFRMUS	Mauritius						MUS	15	1134	222.267700	823.817500
Polygon	AFRMRT	Mauritania	AFRMRT	37	1.00000	24 - 48	136253.00000	MRT	15	3425	3752.148000	395366.700000
Polygon	AFRMOZ	Mozambique	AFRMOZ	57	2.00000	49 - 62	911998.00000	MOZ	49	8550	6265.845000	310067.100000
Polygon	AFRMLI	Mali	AFRMLI	65	3.00000	63 - 78	022526.00000	MLI	1	3859	4631.466000	477822.800000
Polygon	AFRMDG	Madagascar	AFRMDG	47	1.00000	24 - 48	136253.00000	MDG	28	3664	3677.072000	235725.200000
Polygon	AFRMAR	Morocco	AFRMAR	80	4.00000	79 - 97	544415.00000	MAR	1	2100	39.705960	39.370020
Polygon	AFRLSO	Lesotho	AFRLSO	78	3.00000	63 - 78	022526.00000	LSO	1	692	596.273700	11864.040000
Polygon	AFRLBY	Libya						LBY	4	2932	3782.516000	600163.000000
Polygon	AFRLBR	Liberia						LBR	1	1925	1364.195000	37428.340000
Polygon	AFRKEN	Kenya	AFRKEN	57	2.00000	49 - 62	911998.00000	KEN	84	4228	3255.350000	224410.600000
Polygon	AFRGNQ	Equitorial Guinea						GNQ	4	1145	610.730500	10482.740000
Polygon	AFRGNB	Guinea-Bissau						GNB	50	2819	1886.240000	13202.980000
Polygon	AFRGMB	Gambia The						GMB	35	11324	1621.627000	4098.218000
Polygon	AFRGIN	Guinea	AFRGIN	48	1.00000	24 - 48	136253.00000	GIN	16	3984	3077.610000	95625.890000
Polygon	AFRGHA	Ghana	AFRGHA	73	3.00000	63 - 78	022526.00000	GHA	1	1824	1672.312000	91969.130000
Polygon	AFRGAB	Gabon						GAB	4	2574	2213.024000	102900.400000
Polygon	AFRETH	Ethiopia	AFRETH	24	1.00000	24 - 48	136253.00000	ETH	1	3348	3389.897000	429509.300000
Polygon	AFRESH	Sahrawi						ESH	1	846	1885.253000	101791.100000
Polygon	AFRERI	Eritrea	AFRERI	46	1.00000	24 - 48	136253.00000	ERI	345	8750	3073.324000	47433.090000
Polygon	AFREGY	Egypt	AFREGY	97	4.00000	79 - 97	544415.00000	EGY	5	15276	4236.262000	401626.900000
Polygon	AFRDZA	Algeria	AFRDZA	89	4.00000	79 - 97	544415.00000	DZA	4	7442	5087.006000	933061.200000
Polygon	AFRDJI	Djibouti						DJI	1	569	544.790300	8409.849000
Polygon	AFRCPV	Cape Verde						CPV	12	1012	554.557700	1533.394000
Polygon	AFRCOM	Comoros						COM	3	6548	273.731100	639.547600
Polygon	AFRCOG	Congo	AFRCOG	51	2.00000	49 - 62	911998.00000	COG	1	3120	2868.848000	132673.200000
Polygon	AFRCOD	Congo Dem.Rep.	AFRCOD	45	1.00000	24 - 48	136253.00000	COD	13	7350	6455.406000	908303.100000
Polygon	AFRCMR	Cameroon	AFRCMR	58	2.00000	49 - 62	911998.00000	CMR	7	4505	3513.146000	182086.100000
Polygon	AFRCIV	Cîte d'Ivoire	AFRCIV	81	4.00000	79 - 97	544415.00000	CIV	2	2916	2278.587000	124949.000000

FIGURE 2.6: Link to sequence of static shots composing this animation. The goal of this sequence of images is to show the reader how to fill a database field, in ArcView 3.2/3.3, with data converted to "number" format suitable for using to create choropleth maps.





ArcView GIS 3.2

File Edit Table Field Window Help

0 of 114 selected

Attributes of Mergewater.shp

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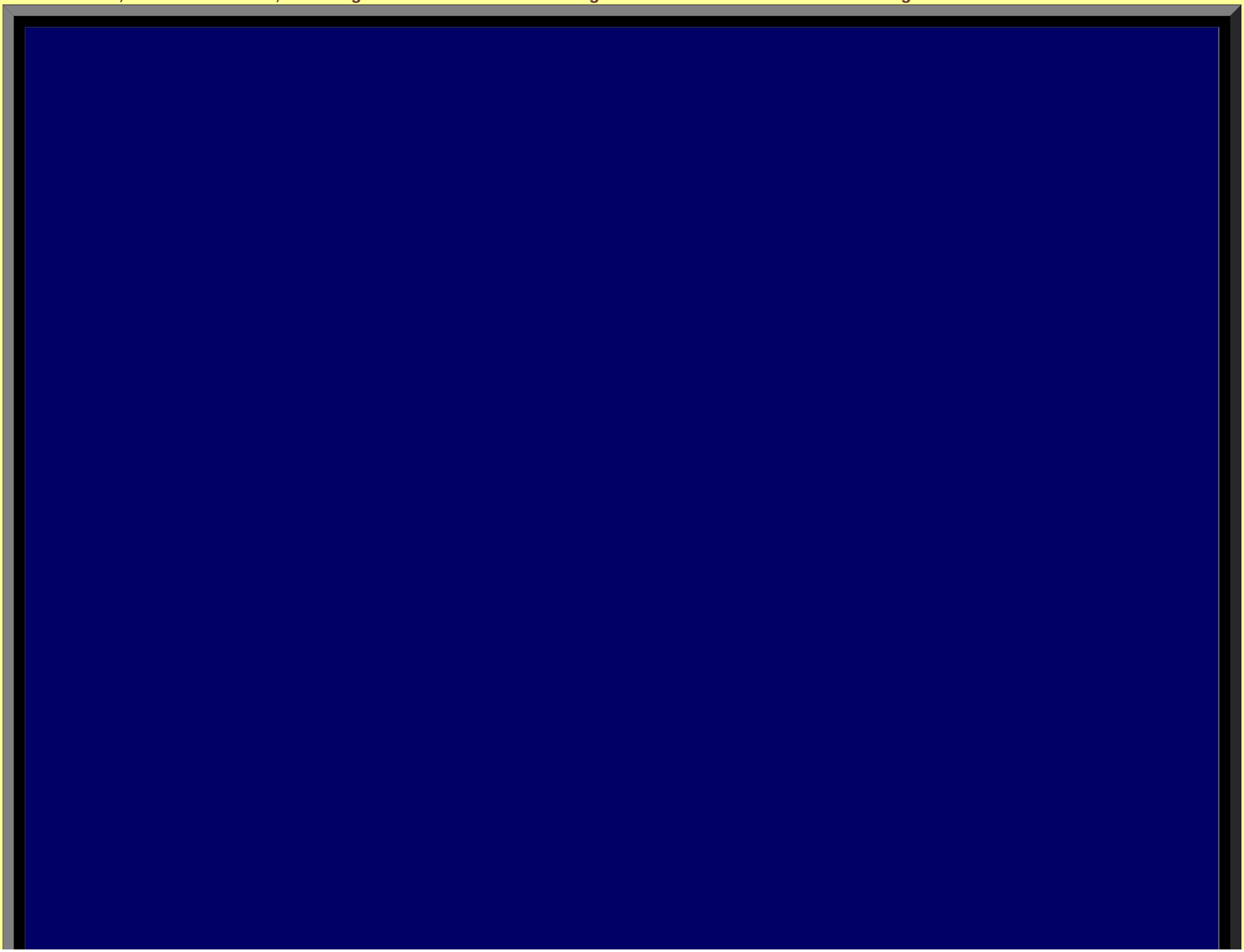
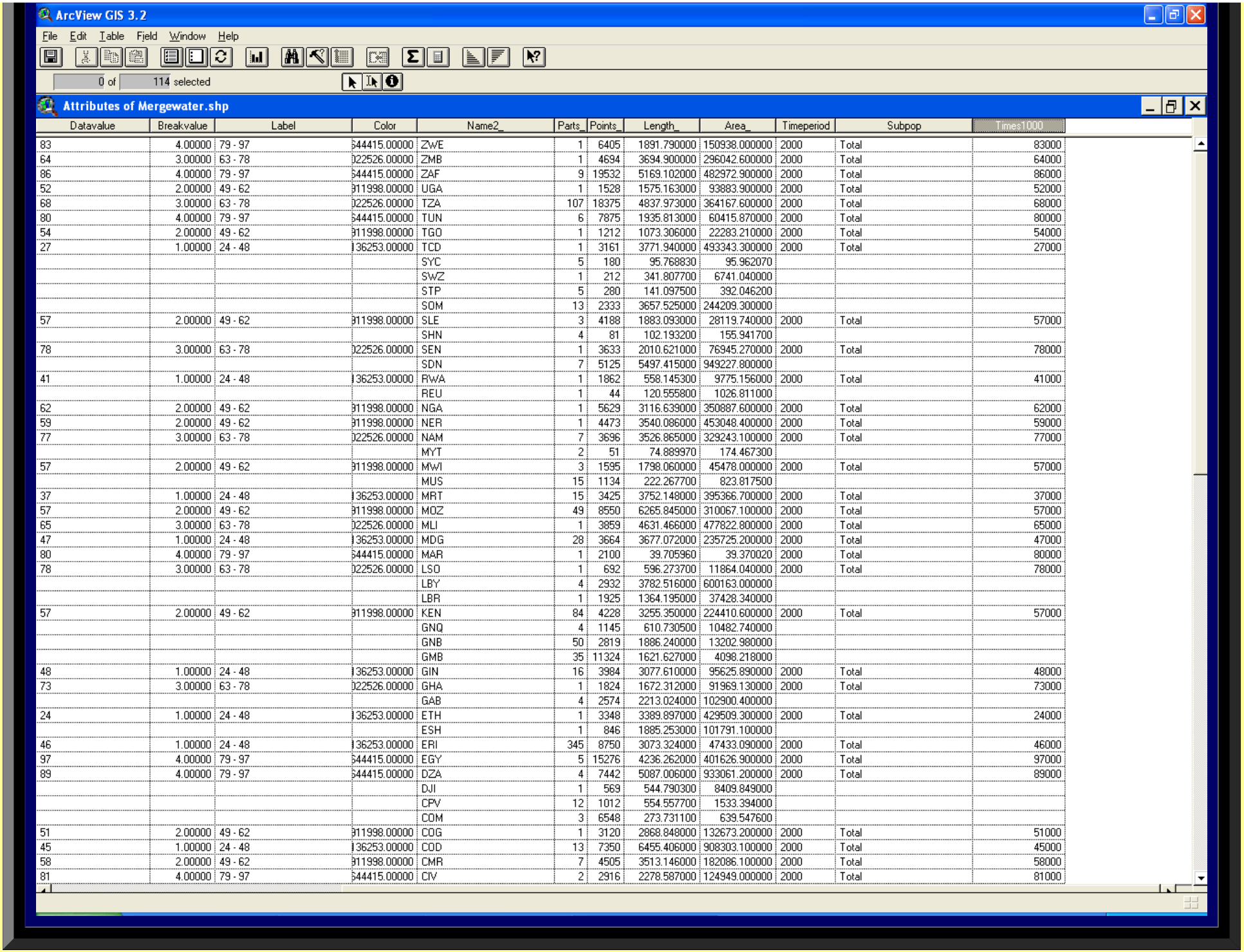
83	4.00000	79 - 97	644415.00000	ZWE	1	6405	1891.790000	150938.000000	2000	Total	
64	3.00000	63 - 78	022526.00000	ZMB	1	4694	3694.900000	296042.600000	2000	Total	
86	4.00000	79 - 97	644415.00000	ZAF	9	19532	5169.102000	482972.900000	2000	Total	
52	2.00000	49 - 62	911998.00000	UGA	1	1528	1575.163000	93883.900000	2000	Total	
68	3.00000	63 - 78	022526.00000	TZA	107	18375	4837.973000	364167.600000	2000	Total	
80	4.00000	79 - 97	644415.00000	TUN	6	7875	1935.813000	60415.870000	2000	Total	
54	2.00000	49 - 62	911998.00000	TGO	1	1212	1073.306000	22283.210000	2000	Total	
27	1.00000	24 - 48	136253.00000	TCD	1	3161	3771.940000	493343.300000	2000	Total	
				SYC	5	180	95.768830	95.962070			
				SWZ	1	212	341.807700	6741.040000			
				STP	5	280	141.097500	392.046200			
				SDM	13	2333	3657.525000	244209.300000			
57	2.00000	49 - 62	911998.00000	SLE	3	4188	1883.093000	28119.740000	2000	Total	
				SHN	4	81	102.193200	155.941700			
78	3.00000	63 - 78	022526.00000	SEN	1	3633	2010.621000	76945.270000	2000	Total	
				SDN	7	5125	5497.415000	949227.800000			
41	1.00000	24 - 48	136253.00000	RWA	1	1862	558.145300	9775.156000	2000	Total	
				REU	1	44	120.555800	1026.811000			
62	2.00000	49 - 62	911998.00000	NGA	1	5629	3116.639000	350887.600000	2000	Total	
59	2.00000	49 - 62	911998.00000	NER	1	4473	3540.086000	453048.400000	2000	Total	
77	3.00000	63 - 78	022526.00000	NAM	7	3696	3526.865000	329243.100000	2000	Total	
				MYT	2	51	74.889970	174.467300			
57	2.00000	49 - 62	911998.00000	MWI	3	1595	1798.060000	45478.000000	2000	Total	
				MUS	15	1134	222.267700	823.817500			
37	1.00000	24 - 48	136253.00000	MRT	15	3425	3752.148000	395366.700000	2000	Total	
57	2.00000	49 - 62	911998.00000	MOZ	49	8550	6265.845000	310067.100000	2000	Total	
65	3.00000	63 - 78	022526.00000	MLI	1	3859	4631.466000	477822.800000	2000	Total	
47	1.00000	24 - 48	136253.00000	MDG	28	3664	3677.072000	235725.200000	2000	Total	
80	4.00000	79 - 97	644415.00000	MAR	1	2100	39.705960	39.370020	2000	Total	
78	3.00000	63 - 78	022526.00000	LSO	1	692	596.273700	11864.040000	2000	Total	
				LBY	4	2932	3782.516000	600163.000000			
				LBR	1	1925	1364.195000	37428.340000			
57	2.00000	49 - 62	911998.00000	KEN	84	4228	3255.350000	224410.600000	2000	Total	
				GNQ	4	1145	610.730500	10482.740000			
				GNB	50	2819	1886.240000	13202.980000			
				GMB	35	11324	1621.627000	4098.218000			
48	1.00000	24 - 48	136253.00000	GIN	16	3984	3077.610000	95625.890000	2000	Total	
73	3.00000	63 - 78	022526.00000	GHA	1	1824	1672.312000	91969.130000	2000	Total	
				GAB	4	2574	2213.024000	102900.400000			
24	1.00000	24 - 48	136253.00000	ETH	1	3348	3389.897000	429509.300000	2000	Total	
				ESH	1	846	1885.253000	101791.100000			
46	1.00000	24 - 48	136253.00000	ERI	345	8750	3073.324000	47433.090000	2000	Total	
97	4.00000	79 - 97	644415.00000	EGY	5	15276	4236.262000	401626.900000	2000	Total	
89	4.00000	79 - 97	644415.00000	DZA	4	7442	5087.006000	933061.200000	2000	Total	
				DJI	1	569	544.790300	8409.849000			
				CPV	12	1012	554.557700	1533.394000			
				COM	3	6548	273.731100	639.547600			
51	2.00000	49 - 62	911998.00000	COG	1	3120	2868.848000	132673.200000	2000	Total	
45	1.00000	24 - 48	136253.00000	COD	13	7350	6455.406000	908303.100000	2000	Total	
58	2.00000	49 - 62	911998.00000	CMR	7	4505	3513.146000	182086.100000	2000	Total	
81	4.00000	79 - 97	644415.00000	CIV	2	2916	2278.587000	124949.000000	2000	Total	

FIGURE 2.7: Link to sequence of static shots composing this animation. The goal of this sequence of images is to show the reader how to create a database field, in ArcView 3.2/3.3, in "string" format suitable for creating date fields for the time slider in Google Earth.





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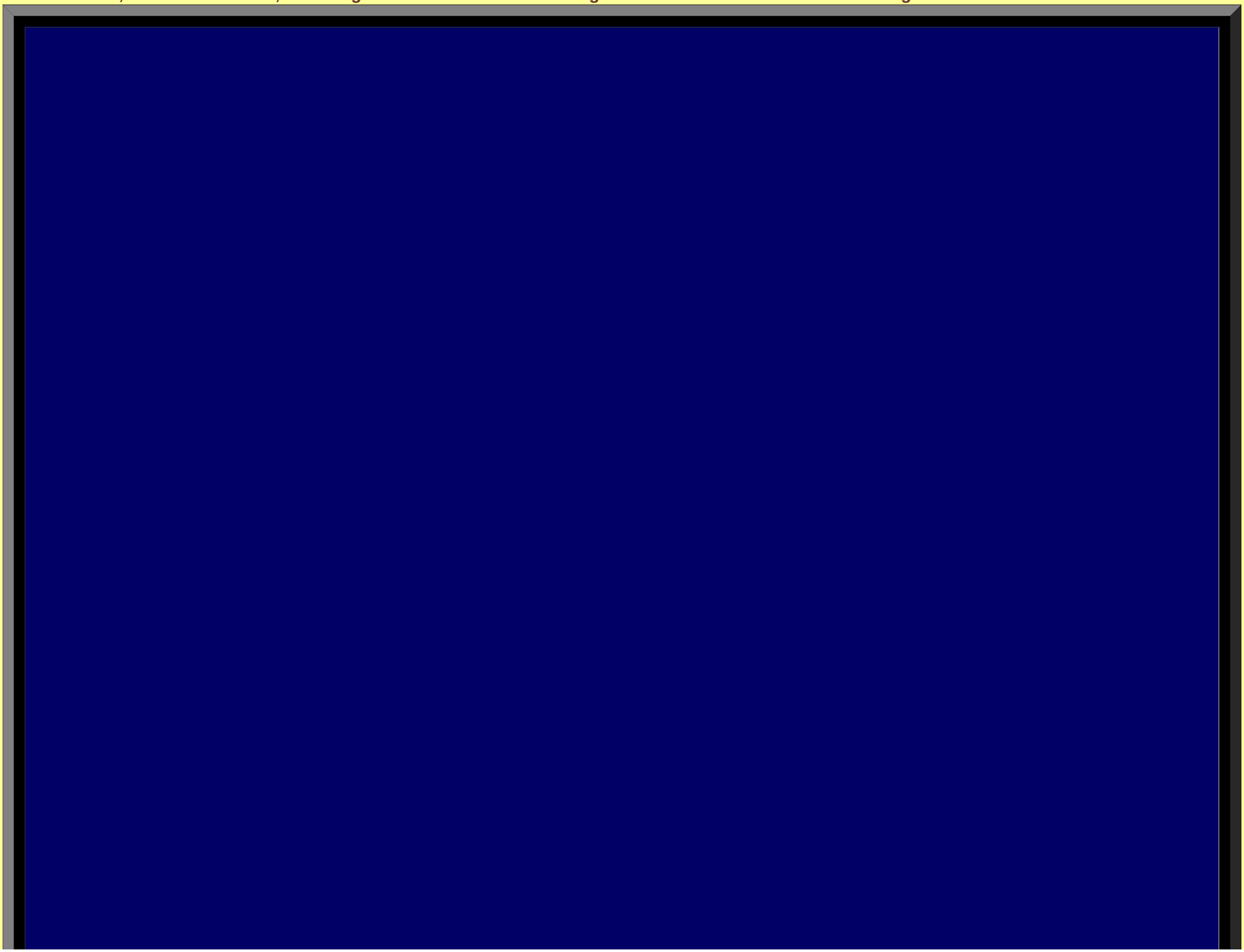
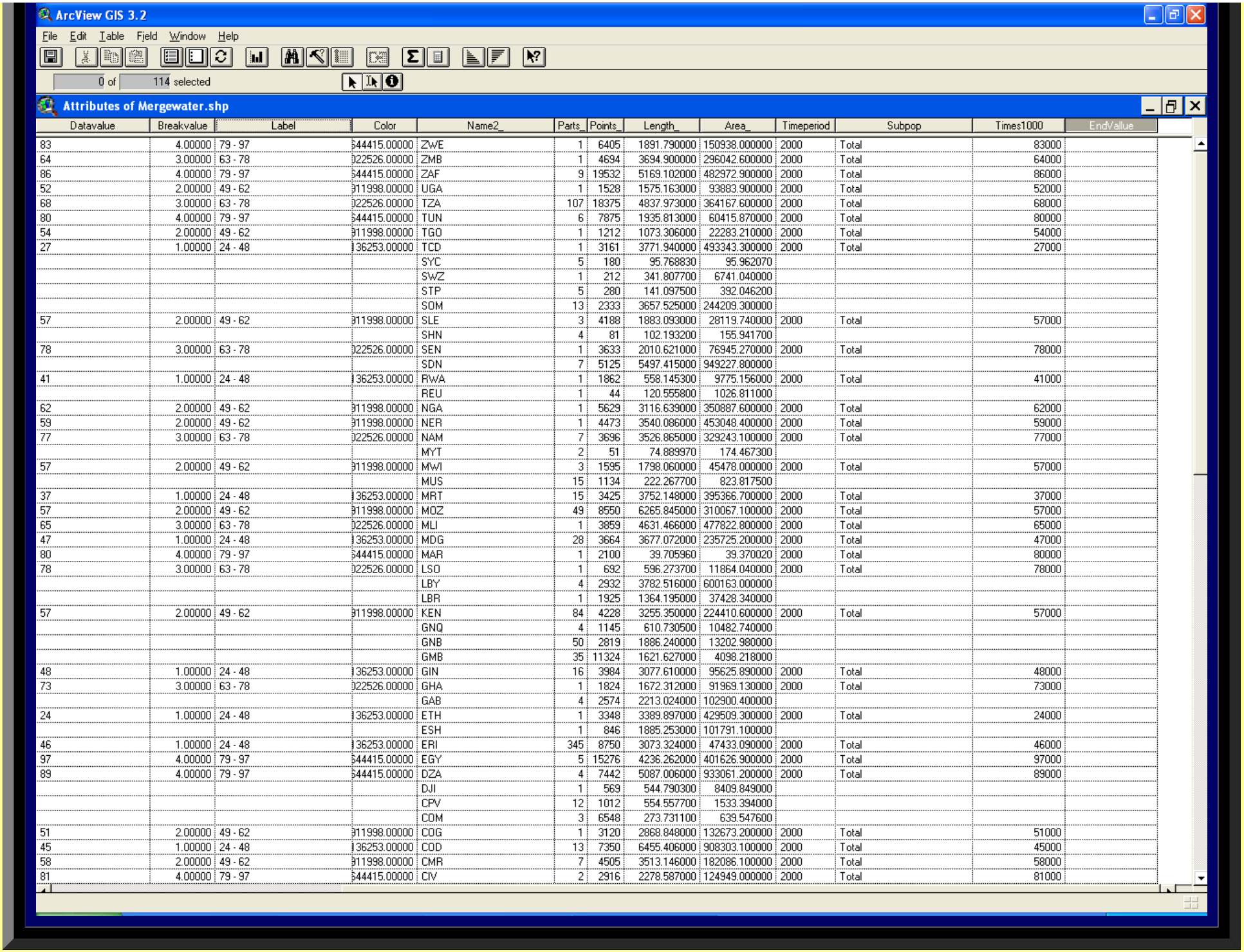
Attributes of Mergewater.shp

Datavalue	Breakvalue	Label	Color	Name2_	Parts_	Points_	Length_	Area_	Timeperiod	Subpop	Times1000
83	4.00000	79 - 97	544415.00000	ZWE	1	6405	1891.790000	150938.000000	2000	Total	83000
64	3.00000	63 - 78	022526.00000	ZMB	1	4694	3694.900000	296042.600000	2000	Total	64000
86	4.00000	79 - 97	544415.00000	ZAF	9	19532	5169.102000	482972.900000	2000	Total	86000
52	2.00000	49 - 62	911998.00000	UGA	1	1528	1575.163000	93883.900000	2000	Total	52000
68	3.00000	63 - 78	022526.00000	TZA	107	18375	4837.973000	364167.600000	2000	Total	68000
80	4.00000	79 - 97	544415.00000	TUN	6	7875	1935.813000	60415.870000	2000	Total	80000
54	2.00000	49 - 62	911998.00000	TGO	1	1212	1073.306000	22283.210000	2000	Total	54000
27	1.00000	24 - 48	136253.00000	TCD	1	3161	3771.940000	493343.300000	2000	Total	27000
				SYC	5	180	95.768830	95.962070			
				SWZ	1	212	341.807700	6741.040000			
				STP	5	280	141.097500	392.046200			
				SDM	13	2333	3657.525000	244209.300000			
57	2.00000	49 - 62	911998.00000	SLE	3	4188	1883.093000	28119.740000	2000	Total	57000
				SHN	4	81	102.193200	155.941700			
78	3.00000	63 - 78	022526.00000	SEN	1	3633	2010.621000	76945.270000	2000	Total	78000
				SDN	7	5125	5497.415000	949227.800000			
41	1.00000	24 - 48	136253.00000	RWA	1	1862	558.145300	9775.156000	2000	Total	41000
				REU	1	44	120.555800	1026.811000			
62	2.00000	49 - 62	911998.00000	NGA	1	5629	3116.639000	350887.600000	2000	Total	62000
59	2.00000	49 - 62	911998.00000	NER	1	4473	3540.086000	453048.400000	2000	Total	59000
77	3.00000	63 - 78	022526.00000	NAM	7	3696	3526.865000	329243.100000	2000	Total	77000
				MYT	2	51	74.889970	174.467300			
57	2.00000	49 - 62	911998.00000	MWI	3	1595	1798.060000	45478.000000	2000	Total	57000
				MUS	15	1134	222.267700	823.817500			
37	1.00000	24 - 48	136253.00000	MRT	15	3425	3752.148000	395366.700000	2000	Total	37000
57	2.00000	49 - 62	911998.00000	MOZ	49	8550	6265.845000	310067.100000	2000	Total	57000
65	3.00000	63 - 78	022526.00000	MLI	1	3859	4631.466000	477822.800000	2000	Total	65000
47	1.00000	24 - 48	136253.00000	MDG	28	3664	3677.072000	235725.200000	2000	Total	47000
80	4.00000	79 - 97	544415.00000	MAR	1	2100	39.705960	39.370020	2000	Total	80000
78	3.00000	63 - 78	022526.00000	LSO	1	692	596.273700	11864.040000	2000	Total	78000
				LBY	4	2932	3782.516000	600163.000000			
				LBR	1	1925	1364.195000	37428.340000			
57	2.00000	49 - 62	911998.00000	KEN	84	4228	3255.350000	224410.600000	2000	Total	57000
				GNQ	4	1145	610.730500	10482.740000			
				GNB	50	2819	1886.240000	13202.980000			
				GMB	35	11324	1621.627000	4098.218000			
48	1.00000	24 - 48	136253.00000	GIN	16	3984	3077.610000	95625.890000	2000	Total	48000
73	3.00000	63 - 78	022526.00000	GHA	1	1824	1672.312000	91969.130000	2000	Total	73000
				GAB	4	2574	2213.024000	102900.400000			
24	1.00000	24 - 48	136253.00000	ETH	1	3348	3389.897000	429509.300000	2000	Total	24000
				ESH	1	846	1885.253000	101791.100000			
46	1.00000	24 - 48	136253.00000	ERI	345	8750	3073.324000	47433.090000	2000	Total	46000
97	4.00000	79 - 97	544415.00000	EGY	5	15276	4236.262000	401626.900000	2000	Total	97000
89	4.00000	79 - 97	544415.00000	DZA	4	7442	5087.006000	933061.200000	2000	Total	89000
				DJI	1	569	544.790300	8409.849000			
				CPV	12	1012	554.557700	1533.394000			
				COM	3	6548	273.731100	639.547600			
51	2.00000	49 - 62	911998.00000	COG	1	3120	2868.848000	132673.200000	2000	Total	51000
45	1.00000	24 - 48	136253.00000	COD	13	7350	6455.406000	908303.100000	2000	Total	45000
58	2.00000	49 - 62	911998.00000	CMR	7	4505	3513.146000	182086.100000	2000	Total	58000
81	4.00000	79 - 97	544415.00000	CIV	2	2916	2278.587000	124949.000000	2000	Total	81000

FIGURE 2.8: Link to sequence of static shots composing this animation. The goal of this sequence of images is to show the reader how to fill a database field, in ArcView 3.2/3.3, in "string" format suitable for creating date fields for the time slider in Google Earth.





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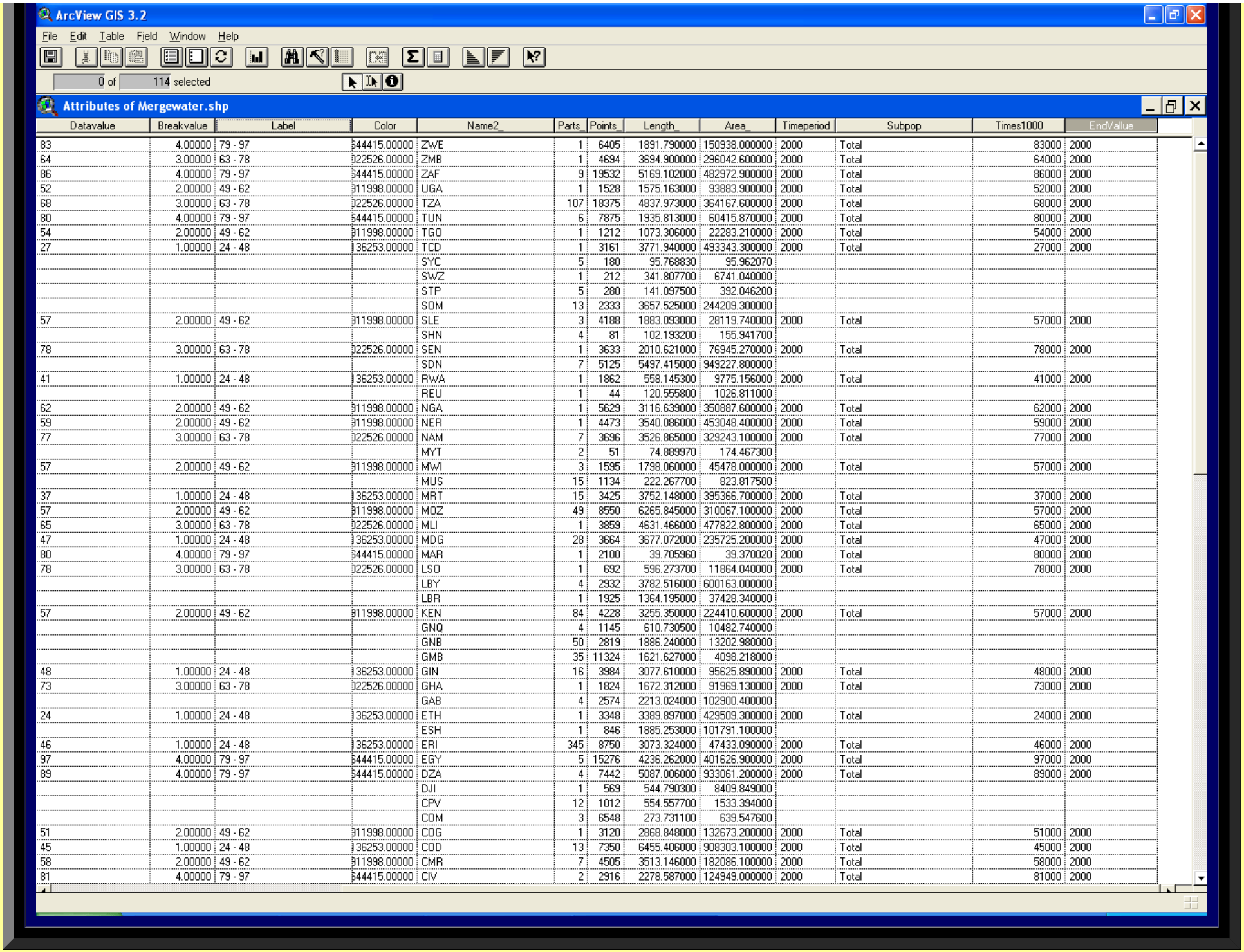
Attributes of Mergewater.shp

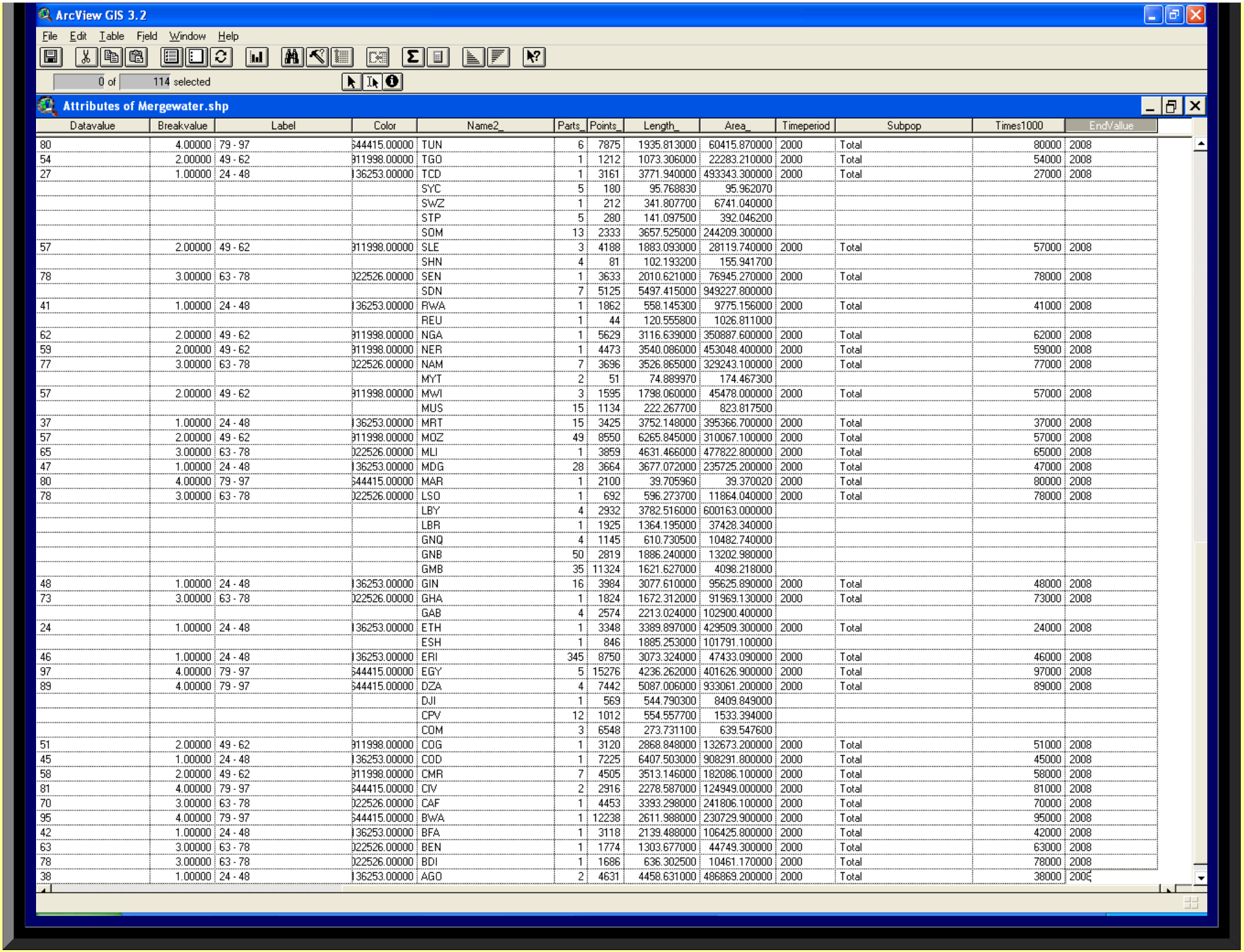
Datavalue	Breakvalue	Label	Color	Name2_	Parts_	Points_	Length_	Area_	Timeperiod	Subpop	Times1000	EndValue
83	4.00000	79 - 97	544415.00000	ZWE	1	6405	1891.790000	150938.000000	2000	Total	83000	
64	3.00000	63 - 78	022526.00000	ZMB	1	4694	3694.900000	296042.600000	2000	Total	64000	
86	4.00000	79 - 97	544415.00000	ZAF	9	19532	5169.102000	482972.900000	2000	Total	86000	
52	2.00000	49 - 62	911998.00000	UGA	1	1528	1575.163000	93883.900000	2000	Total	52000	
68	3.00000	63 - 78	022526.00000	TZA	107	18375	4837.973000	364167.600000	2000	Total	68000	
80	4.00000	79 - 97	544415.00000	TUN	6	7875	1935.813000	60415.870000	2000	Total	80000	
54	2.00000	49 - 62	911998.00000	TGO	1	1212	1073.306000	22283.210000	2000	Total	54000	
27	1.00000	24 - 48	136253.00000	TCD	1	3161	3771.940000	493343.300000	2000	Total	27000	
				SYC	5	180	95.768830	95.962070				
				SWZ	1	212	341.807700	6741.040000				
				STP	5	280	141.097500	392.046200				
				SDM	13	2333	3657.525000	244209.300000				
57	2.00000	49 - 62	911998.00000	SLE	3	4188	1883.093000	28119.740000	2000	Total	57000	
				SHN	4	81	102.193200	155.941700				
78	3.00000	63 - 78	022526.00000	SEN	1	3633	2010.621000	76945.270000	2000	Total	78000	
				SDN	7	5125	5497.415000	949227.800000				
41	1.00000	24 - 48	136253.00000	RWA	1	1862	558.145300	9775.156000	2000	Total	41000	
				REU	1	44	120.555800	1026.811000				
62	2.00000	49 - 62	911998.00000	NGA	1	5629	3116.639000	350887.600000	2000	Total	62000	
59	2.00000	49 - 62	911998.00000	NER	1	4473	3540.086000	453048.400000	2000	Total	59000	
77	3.00000	63 - 78	022526.00000	NAM	7	3696	3526.865000	329243.100000	2000	Total	77000	
				MYT	2	51	74.889970	174.467300				
57	2.00000	49 - 62	911998.00000	MWI	3	1595	1798.060000	45478.000000	2000	Total	57000	
				MUS	15	1134	222.267700	823.817500				
37	1.00000	24 - 48	136253.00000	MRT	15	3425	3752.148000	395366.700000	2000	Total	37000	
57	2.00000	49 - 62	911998.00000	MOZ	49	8550	6265.845000	310067.100000	2000	Total	57000	
65	3.00000	63 - 78	022526.00000	MLI	1	3859	4631.466000	477822.800000	2000	Total	65000	
47	1.00000	24 - 48	136253.00000	MDG	28	3664	3677.072000	235725.200000	2000	Total	47000	
80	4.00000	79 - 97	544415.00000	MAR	1	2100	39.705960	39.370020	2000	Total	80000	
78	3.00000	63 - 78	022526.00000	LSO	1	692	596.273700	11864.040000	2000	Total	78000	
				LBY	4	2932	3782.516000	600163.000000				
				LBR	1	1925	1364.195000	37428.340000				
57	2.00000	49 - 62	911998.00000	KEN	84	4228	3255.350000	224410.600000	2000	Total	57000	
				GNQ	4	1145	610.730500	10482.740000				
				GNB	50	2819	1886.240000	13202.980000				
				GMB	35	11324	1621.627000	4098.218000				
48	1.00000	24 - 48	136253.00000	GIN	16	3984	3077.610000	95625.890000	2000	Total	48000	
73	3.00000	63 - 78	022526.00000	GHA	1	1824	1672.312000	91969.130000	2000	Total	73000	
				GAB	4	2574	2213.024000	102900.400000				
24	1.00000	24 - 48	136253.00000	ETH	1	3348	3389.897000	429509.300000	2000	Total	24000	
				ESH	1	846	1885.253000	101791.100000				
46	1.00000	24 - 48	136253.00000	ERI	345	8750	3073.324000	47433.090000	2000	Total	46000	
97	4.00000	79 - 97	544415.00000	EGY	5	15276	4236.262000	401626.900000	2000	Total	97000	
89	4.00000	79 - 97	544415.00000	DZA	4	7442	5087.006000	933061.200000	2000	Total	89000	
				DJI	1	569	544.790300	8409.849000				
				CPV	12	1012	554.557700	1533.394000				
				COM	3	6548	273.731100	639.547600				
51	2.00000	49 - 62	911998.00000	COG	1	3120	2868.848000	132673.200000	2000	Total	51000	
45	1.00000	24 - 48	136253.00000	COD	13	7350	6455.406000	908303.100000	2000	Total	45000	
58	2.00000	49 - 62	911998.00000	CMR	7	4505	3513.146000	182086.100000	2000	Total	58000	
81	4.00000	79 - 97	544415.00000	CIV	2	2916	2278.587000	124949.000000	2000	Total	81000	

FIGURE 2.9: Link to sequence of static shots composing this animation. The goal of this sequence of images is to show the reader how to change entries in a database field, in ArcView 3.2/3.3, using the "edit" button. Frequent use will be made of the Windows universal commands, on highlighted text, of "ctrl +c" for "copy" and "ctrl +v" for "paste."



Datavalue	Breakvalue	Label	Color	Name2_	Parts_	Points_	Length_	Area_	Timeperiod	Subpop	Times1000	EndValue
83	4.00000	79 - 97	544415.00000	ZWE	1	6405	1891.790000	150938.000000	2000	Total	83000	2000
64	3.00000	63 - 78	022526.00000	ZMB	1	4694	3694.900000	296042.600000	2000	Total	64000	2000
86	4.00000	79 - 97	544415.00000	ZAF	9	19532	5169.102000	482972.900000	2000	Total	86000	2000
52	2.00000	49 - 62	911998.00000	UGA	1	1528	1575.163000	93883.900000	2000	Total	52000	2000
68	3.00000	63 - 78	022526.00000	TZA	107	18375	4837.973000	364167.600000	2000	Total	68000	2000
80	4.00000	79 - 97	544415.00000	TUN	6	7875	1935.813000	60415.870000	2000	Total	80000	2000
54	2.00000	49 - 62	911998.00000	TGO	1	1212	1073.306000	22283.210000	2000	Total	54000	2000
27	1.00000	24 - 48	136253.00000	TCD	1	3161	3771.940000	493343.300000	2000	Total	27000	2000
				SYC	5	180	95.768830	95.962070				
				SWZ	1	212	341.807700	6741.040000				
				STP	5	280	141.097500	392.046200				
				SDM	13	2333	3657.525000	244209.300000				
57	2.00000	49 - 62	911998.00000	SLE	3	4188	1883.093000	28119.740000	2000	Total	57000	2000
				SHN	4	81	102.193200	155.941700				
78	3.00000	63 - 78	022526.00000	SEN	1	3633	2010.621000	76945.270000	2000	Total	78000	2000
				SDN	7	5125	5497.415000	949227.800000				
41	1.00000	24 - 48	136253.00000	RWA	1	1862	558.145300	9775.156000	2000	Total	41000	2000
				REU	1	44	120.555800	1026.811000				
62	2.00000	49 - 62	911998.00000	NGA	1	5629	3116.639000	350887.600000	2000	Total	62000	2000
59	2.00000	49 - 62	911998.00000	NER	1	4473	3540.086000	453048.400000	2000	Total	59000	2000
77	3.00000	63 - 78	022526.00000	NAM	7	3696	3526.865000	329243.100000	2000	Total	77000	2000
				MYT	2	51	74.889970	174.467300				
57	2.00000	49 - 62	911998.00000	MWI	3	1595	1798.060000	45478.000000	2000	Total	57000	2000
				MUS	15	1134	222.267700	823.817500				
37	1.00000	24 - 48	136253.00000	MRT	15	3425	3752.148000	395366.700000	2000	Total	37000	2000
57	2.00000	49 - 62	911998.00000	MOZ	49	8550	6265.845000	310067.100000	2000	Total	57000	2000
65	3.00000	63 - 78	022526.00000	MLI	1	3859	4631.466000	477822.800000	2000	Total	65000	2000
47	1.00000	24 - 48	136253.00000	MDG	28	3664	3677.072000	235725.200000	2000	Total	47000	2000
80	4.00000	79 - 97	544415.00000	MAR	1	2100	39.705960	39.370020	2000	Total	80000	2000
78	3.00000	63 - 78	022526.00000	LSO	1	692	596.273700	11864.040000	2000	Total	78000	2000
				LBY	4	2932	3782.516000	600163.000000				
				LBR	1	1925	1364.195000	37428.340000				
57	2.00000	49 - 62	911998.00000	KEN	84	4228	3255.350000	224410.600000	2000	Total	57000	2000
				GNQ	4	1145	610.730500	10482.740000				
				GNB	50	2819	1886.240000	13202.980000				
				GMB	35	11324	1621.627000	4098.218000				
48	1.00000	24 - 48	136253.00000	GIN	16	3984	3077.610000	95625.890000	2000	Total	48000	2000
73	3.00000	63 - 78	022526.00000	GHA	1	1824	1672.312000	91969.130000	2000	Total	73000	2000
				GAB	4	2574	2213.024000	102900.400000				
24	1.00000	24 - 48	136253.00000	ETH	1	3348	3389.897000	429509.300000	2000	Total	24000	2000
				ESH	1	846	1885.253000	101791.100000				
46	1.00000	24 - 48	136253.00000	ERI	345	8750	3073.324000	47433.090000	2000	Total	46000	2000
97	4.00000	79 - 97	544415.00000	EGY	5	15276	4236.262000	401626.900000	2000	Total	97000	2000
89	4.00000	79 - 97	544415.00000	DZA	4	7442	5087.006000	933061.200000	2000	Total	89000	2000
				DJI	1	569	544.790300	8409.849000				
				CPV	12	1012	554.557700	1533.394000				
				COM	3	6548	273.731100	639.547600				
51	2.00000	49 - 62	911998.00000	COG	1	3120	2868.848000	132673.200000	2000	Total	51000	2000
45	1.00000	24 - 48	136253.00000	COD	13	7350	6455.406000	908303.100000	2000	Total	45000	2000
58	2.00000	49 - 62	911998.00000	CMR	7	4505	3513.146000	182086.100000	2000	Total	58000	2000
81	4.00000	79 - 97	544415.00000	CIV	2	2916	2278.587000	124949.000000	2000	Total	81000	2000

FIGURE 2.10: Link to sequence of static shots composing this animation. The goal of this sequence of images is to show the reader how to stop editing entries in a database field, in ArcView 3.2/3.3, and save them.



ArcView GIS 3.2

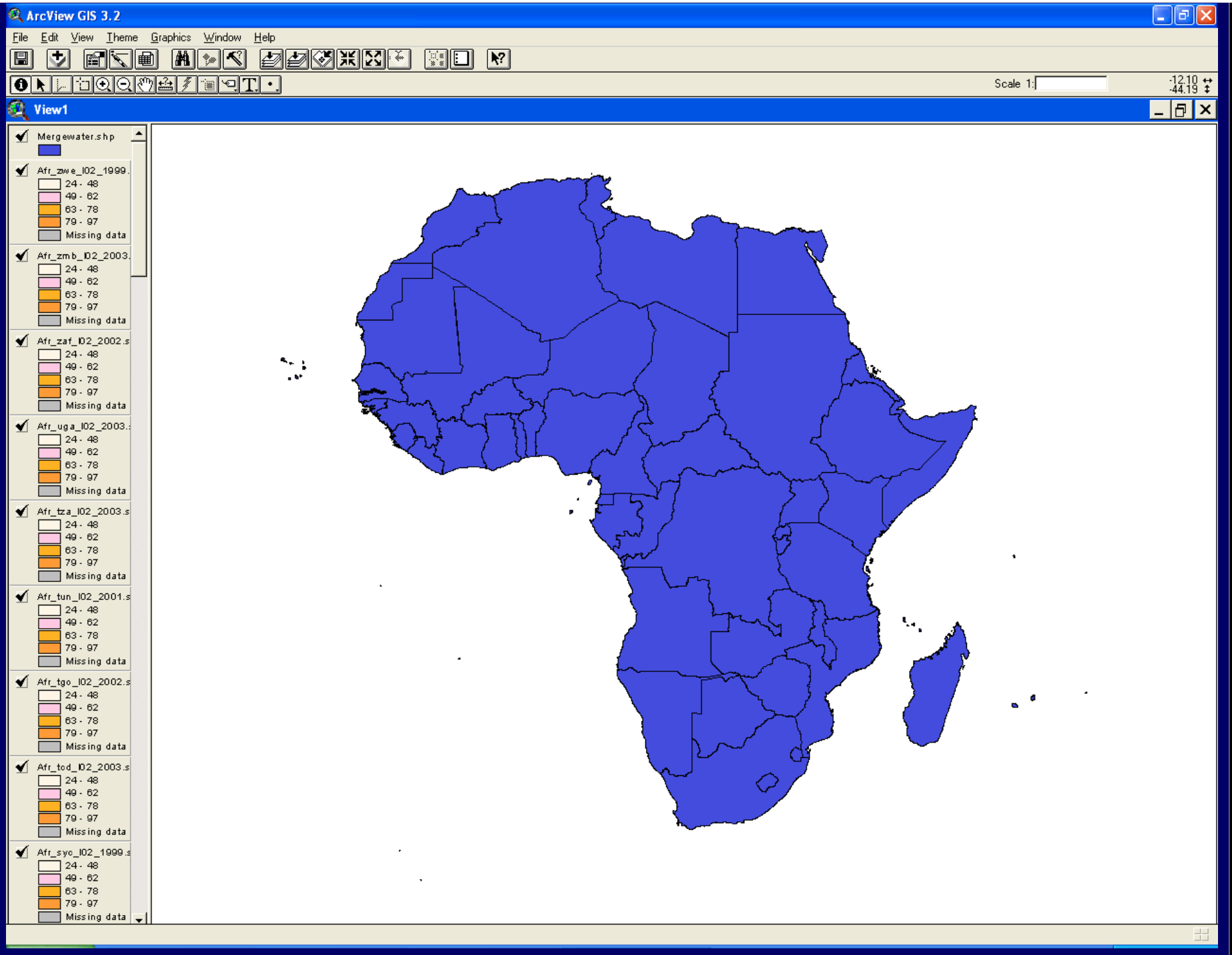
File Edit Table Field Window Help

0 of 114 selected

Attributes of Mergewater.shp

Datavalue	Breakvalue	Label	Color	Name2_	Parts_	Points_	Length_	Area_	Timeperiod	Subpop	Times1000	EndValue
80	4.00000	79 - 97	544415.00000	TUN	6	7875	1935.813000	60415.870000	2000	Total	80000	2008
54	2.00000	49 - 62	911998.00000	TGO	1	1212	1073.306000	22283.210000	2000	Total	54000	2008
27	1.00000	24 - 48	136253.00000	TCD	1	3161	3771.940000	493343.300000	2000	Total	27000	2008
				SYC	5	180	95.768830	95.962070				
				SWZ	1	212	341.807700	6741.040000				
				STP	5	280	141.097500	392.046200				
				SOM	13	2333	3657.525000	244209.300000				
57	2.00000	49 - 62	911998.00000	SLE	3	4188	1883.093000	28119.740000	2000	Total	57000	2008
				SHN	4	81	102.193200	155.941700				
78	3.00000	63 - 78	022526.00000	SEN	1	3633	2010.621000	76945.270000	2000	Total	78000	2008
				SDN	7	5125	5497.415000	949227.800000				
41	1.00000	24 - 48	136253.00000	RWA	1	1862	558.145300	9775.156000	2000	Total	41000	2008
				REU	1	44	120.555800	1026.811000				
62	2.00000	49 - 62	911998.00000	NGA	1	5629	3116.639000	350887.600000	2000	Total	62000	2008
59	2.00000	49 - 62	911998.00000	NER	1	4473	3540.086000	453048.400000	2000	Total	59000	2008
77	3.00000	63 - 78	022526.00000	NAM	7	3696	3526.865000	329243.100000	2000	Total	77000	2008
				MYT	2	51	74.889970	174.467300				
57	2.00000	49 - 62	911998.00000	MWI	3	1595	1798.060000	45478.000000	2000	Total	57000	2008
				MUS	15	1134	222.267700	823.817500				
37	1.00000	24 - 48	136253.00000	MRT	15	3425	3752.148000	395366.700000	2000	Total	37000	2008
57	2.00000	49 - 62	911998.00000	MOZ	49	8550	6265.845000	310067.100000	2000	Total	57000	2008
65	3.00000	63 - 78	022526.00000	MLI	1	3859	4631.466000	477822.800000	2000	Total	65000	2008
47	1.00000	24 - 48	136253.00000	MDG	28	3664	3677.072000	235725.200000	2000	Total	47000	2008
80	4.00000	79 - 97	544415.00000	MAR	1	2100	39.705960	39.370020	2000	Total	80000	2008
78	3.00000	63 - 78	022526.00000	LSO	1	692	596.273700	11864.040000	2000	Total	78000	2008
				LBY	4	2932	3782.516000	600163.000000				
				LBR	1	1925	1364.195000	37428.340000				
				GNQ	4	1145	610.730500	10482.740000				
				GNB	50	2819	1886.240000	13202.980000				
				GMB	35	11324	1621.627000	4098.218000				
48	1.00000	24 - 48	136253.00000	GIN	16	3984	3077.610000	95625.890000	2000	Total	48000	2008
73	3.00000	63 - 78	022526.00000	GHA	1	1824	1672.312000	91969.130000	2000	Total	73000	2008
				GAB	4	2574	2213.024000	102900.400000				
24	1.00000	24 - 48	136253.00000	ETH	1	3348	3389.897000	429509.300000	2000	Total	24000	2008
				ESH	1	846	1885.253000	101791.100000				
46	1.00000	24 - 48	136253.00000	ERI	345	8750	3073.324000	47433.090000	2000	Total	46000	2008
97	4.00000	79 - 97	544415.00000	EGY	5	15276	4236.262000	401626.900000	2000	Total	97000	2008
89	4.00000	79 - 97	544415.00000	DZA	4	7442	5087.006000	933061.200000	2000	Total	89000	2008
				DJI	1	569	544.790300	8409.849000				
				CPV	12	1012	554.557700	1533.394000				
				COM	3	6548	273.731100	639.547600				
51	2.00000	49 - 62	911998.00000	COG	1	3120	2868.848000	132673.200000	2000	Total	51000	2008
45	1.00000	24 - 48	136253.00000	COD	1	7225	6407.503000	908291.800000	2000	Total	45000	2008
58	2.00000	49 - 62	911998.00000	CMR	7	4505	3513.146000	182086.100000	2000	Total	58000	2008
81	4.00000	79 - 97	544415.00000	CIV	2	2916	2278.587000	124949.000000	2000	Total	81000	2008
70	3.00000	63 - 78	022526.00000	CAF	1	4453	3393.298000	241806.100000	2000	Total	70000	2008
95	4.00000	79 - 97	544415.00000	BWA	1	12238	2611.988000	230729.900000	2000	Total	95000	2008
42	1.00000	24 - 48	136253.00000	BFA	1	3118	2139.488000	106425.800000	2000	Total	42000	2008
63	3.00000	63 - 78	022526.00000	BEN	1	1774	1303.677000	44749.300000	2000	Total	63000	2008
78	3.00000	63 - 78	022526.00000	BDI	1	1686	636.302500	10461.170000	2000	Total	78000	2008
38	1.00000	24 - 48	136253.00000	AGO	2	4631	4458.631000	486869.200000	2000	Total	38000	2008

FIGURE 2.11: Link to sequence of static shots composing this animation. The goal of this sequence of images is to show the reader how to save and exit in ArcView 3.2/3.3.



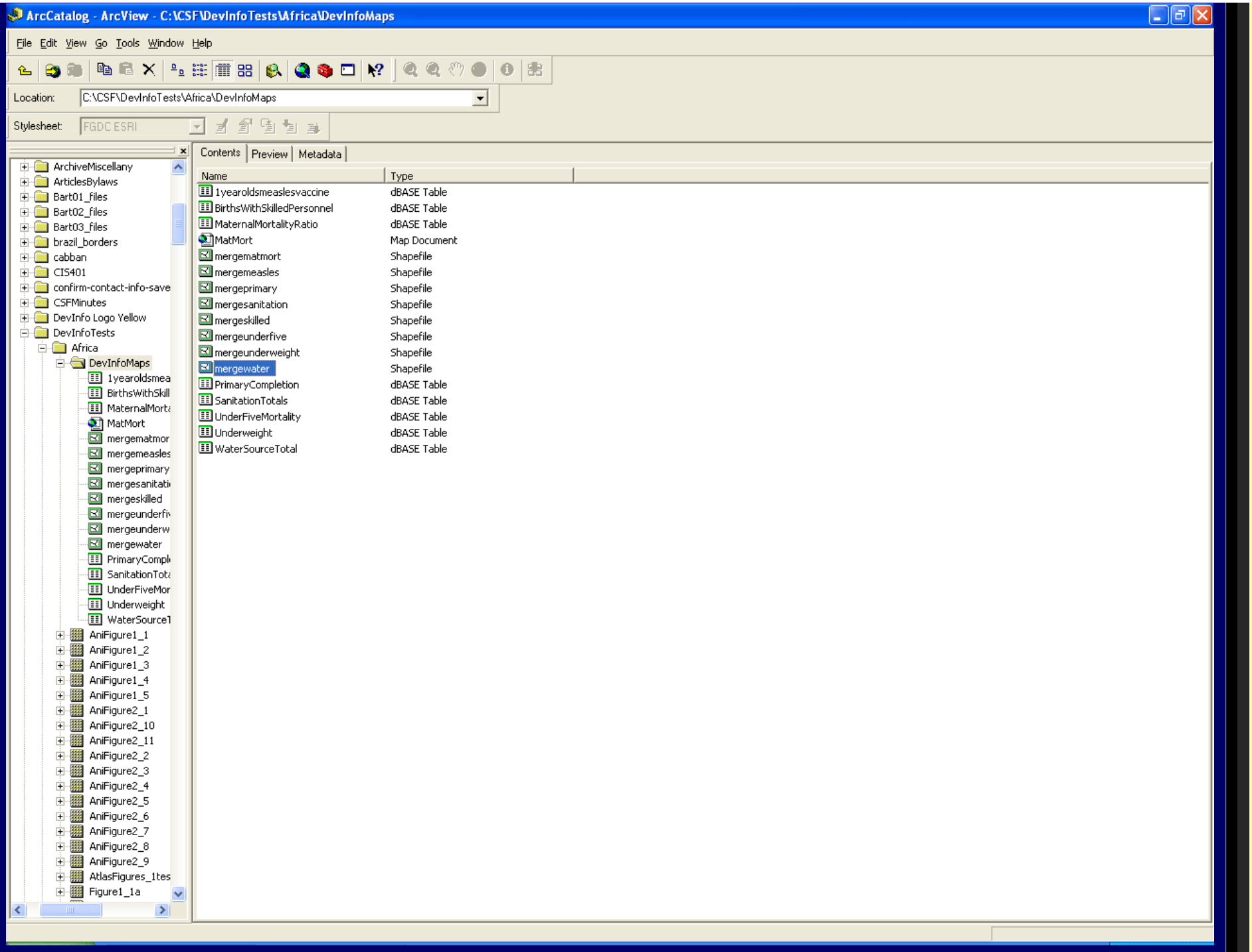
RESULTANT FILES:

- **Maternal mortality ratio, edited .apr**
- **Prevalence of underweight (moderate and severe)--Percent, Total < 5 yr., edited .apr**
- **Primary Completion Rate, Rate, Total, edited .apr**
- **Proportion of 1 year-old children immunised against measles, Percent, Total 1 yr., edited .apr**
- **Proportion of births attended by skilled health personnel, Percent, Total, edited .apr**
- **Proportion of population with access to improved sanitation, Percent, Total, edited .apr**
- **Proportion of population with sustainable access to an improved water source, Percent, Total, edited .apr**
- **Under-five mortality rate, Deaths per 1000 live births, Total, edited .apr**

SECTION 3: ARC CATALOG

ArcCatalog is part of the more recent ESRI ArcGIS. This particular piece of that packages permits the projection of maps. The shape files created from the .apr files in ArcView are not projected files and therefore cannot be subjected to further analysis in more modern GIS software. One must first project them.

FIGURE 3.1: Link to sequence of static shots composing this animation. The goal of this sequence of images is to show the reader how to project the shape files produced in Section 2 so that they might be further processed later in both ArcMap and in Google Earth.

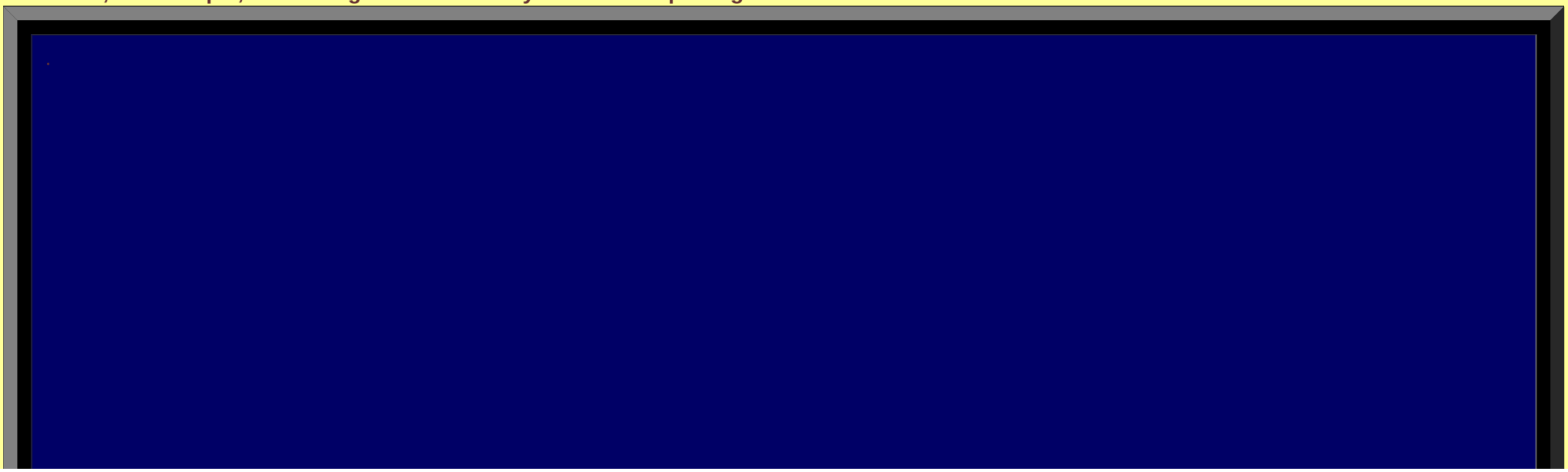


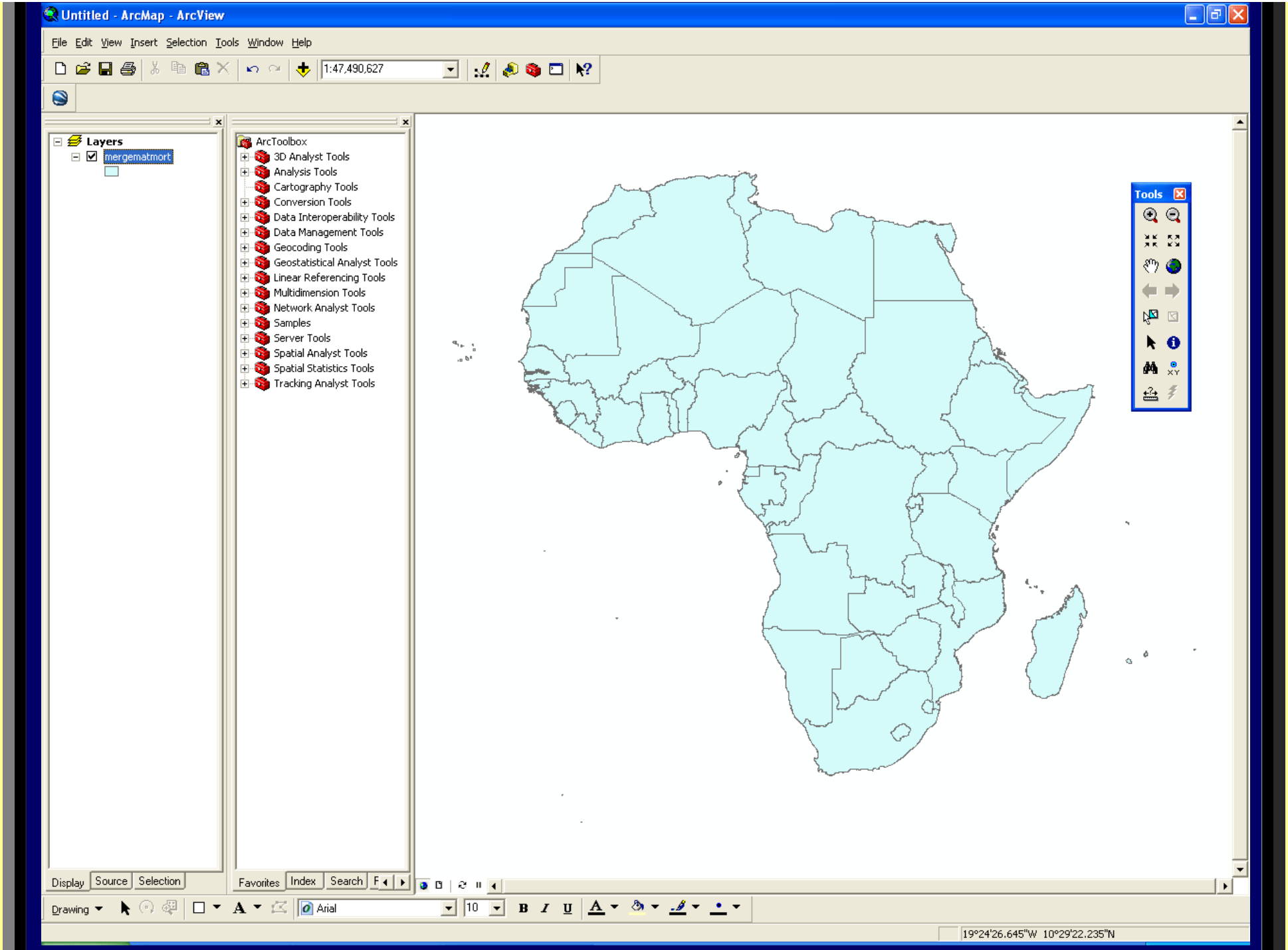
RESULTANT FILES:

- **Maternal mortality ratio:** | dbf | prj | shp | shx |
- **Prevalence of underweight (moderate and severe)--Percent, Total < 5 yr.:** | dbf | prj | shp | shx |
- **Primary Completion Rate, Rate, Total:** | dbf | prj | shp | shx |
- **Proportion of 1 year-old children immunised against measles, Percent, Total 1 yr.:** | dbf | prj | shp | shx |
- **Proportion of births attended by skilled health personnel, Percent, Total:** | dbf | prj | shp | shx |
- **Proportion of population with access to improved sanitation, Percent, Total:** | dbf | prj | shp | shx |
- **Proportion of population with sustainable access to an improved water source, Percent, Total:** | dbf | prj | shp | shx |
- **Under-five mortality rate, Deaths per 1000 live births, Total:** | dbf | prj | shp | shx |

SECTION 4: ARC MAP 9.X

FIGURE 4.1: Link **to sequence of static shots composing this animation. The goal of this sequence of images is to show the reader how to create a choropleth map (ranged fill by data interval) from the edited .apr file extracted originally from DevInfo. Try right-clicking in selected places to find shortcuts, for example, in coloring the outline of symbols. This package is rich in detail.**





Set of choropleth maps for all available indicators, mxd format

Download and install "export shape to KML" plug-in for ArcMap 9.2 plus.

- **Zipped file**
- **Link to external download page**

FIGURE 4.2: Link to sequence of static shots composing this animation. The goal of this sequence of images is to show the reader how to begin to generate a kml file for Google Earth from a choropleth map (ranged fill by data interval) from the edited .apr file extracted originally from DevInfo.

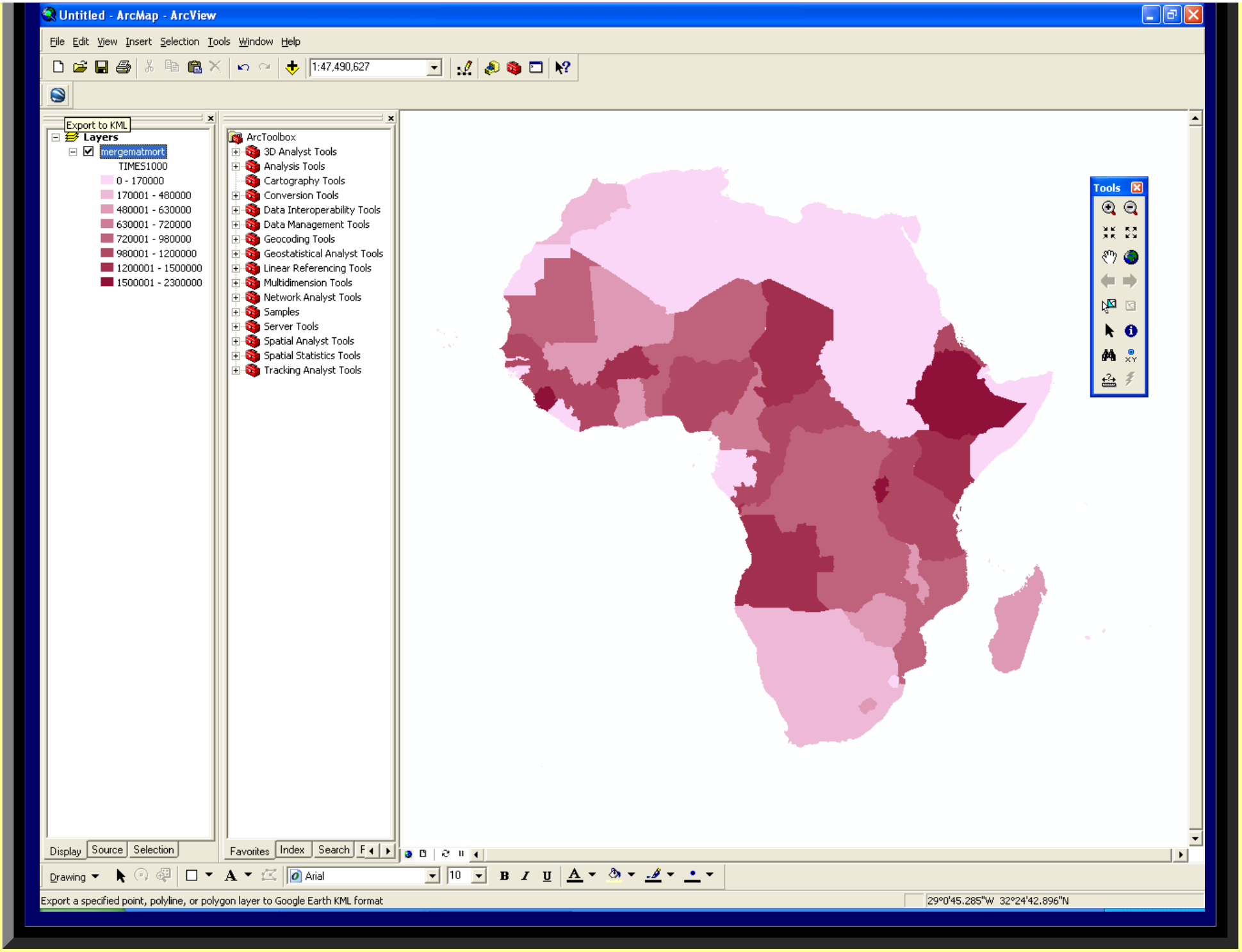
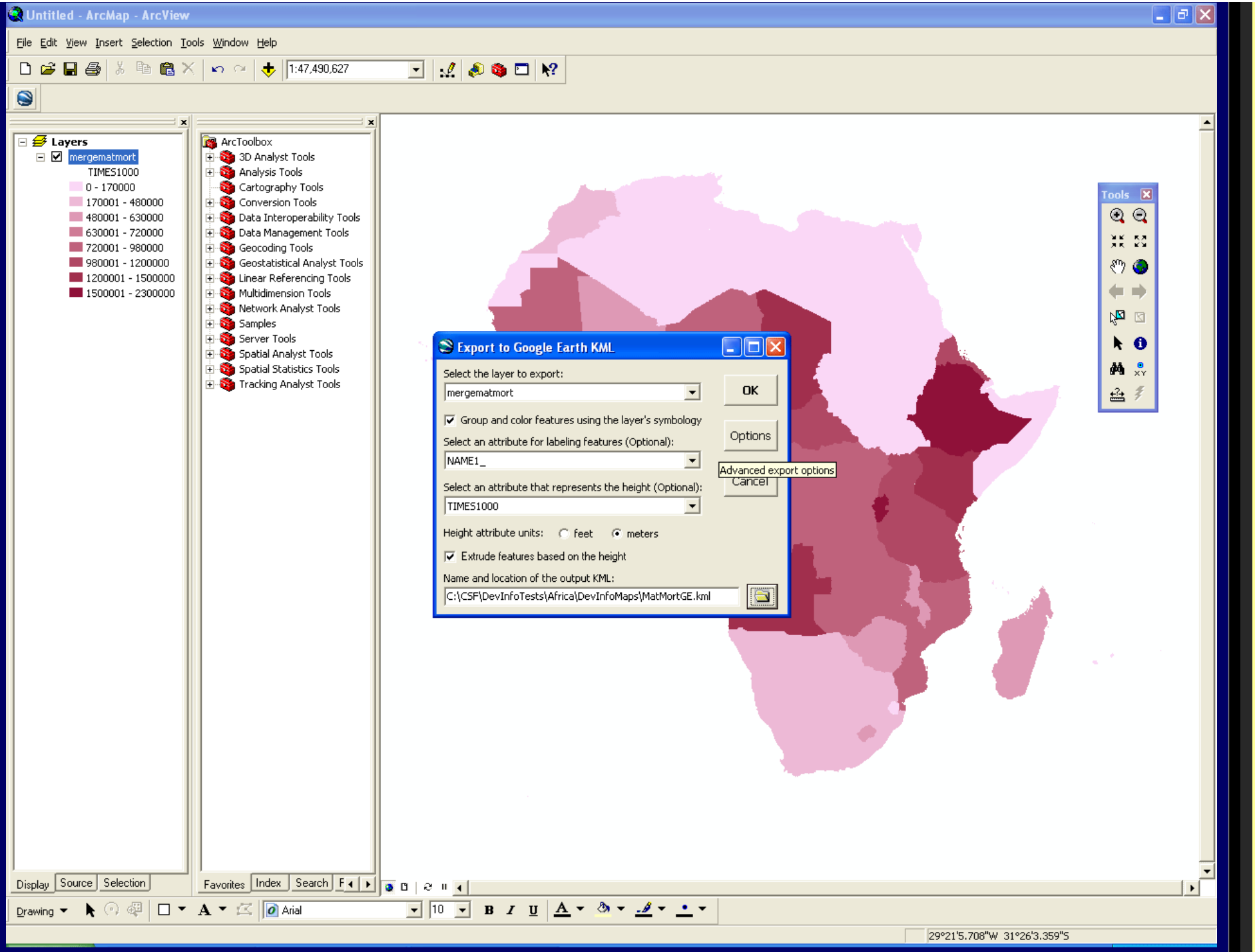

Untitled - ArcMap - ArcView
File Edit View Insert Selection Tools Window Help
1:47,490,627
Export to KML
Layers
mergematmort
TIMES1000
0 - 170000
170001 - 480000
480001 - 630000
630001 - 720000
720001 - 980000
980001 - 1200000
1200001 - 1500000
1500001 - 2300000
ArcToolbox
3D Analyst Tools
Analysis Tools
Cartography Tools
Conversion Tools
Data Interoperability Tools
Data Management Tools
Geocoding Tools
Geostatistical Analyst Tools
Linear Referencing Tools
Multidimension Tools
Network Analyst Tools
Samples
Server Tools
Spatial Analyst Tools
Spatial Statistics Tools
Tracking Analyst Tools
Tools
Display Source Selection
Favorites Index Search
Drawing
Arial
10
Export a specified point, polyline, or polygon layer to Google Earth KML format
29°0'45.285"W 32°24'42.896"N

FIGURE 4.3: Link to sequence of static shots composing this animation. The goal of this sequence of images is to show the reader how to complete the generation of a kml file for Google Earth from a choropleth map (ranged fill by data interval) from the edited .apr file extracted originally from DevInfo.



RESULTANT FILES:

- Maternal mortality ratio, kml
- Prevalence of underweight (moderate and severe)--Percent, Total < 5 yr., kml
- Primary Completion Rate, Rate, Total, kml
- Proportion of 1 year-old children immunised against measles, Percent, Total 1 yr., kml
- Proportion of births attended by skilled health personnel, Percent, Total, kml
- Proportion of population with access to improved sanitation, Percent, Total, kml
- Proportion of population with sustainable access to an improved water source, Percent, Total, kml
- Under-five mortality rate, Deaths per 1000 live births, Total, kml

SECTION 5: GOOGLE EARTH

FIGURE 5.1: Link to sequence of static shots composing this animation. The goal of this sequence of images is to show the reader one way to edit files in Google Earth so that coplanar polygons are eliminated.

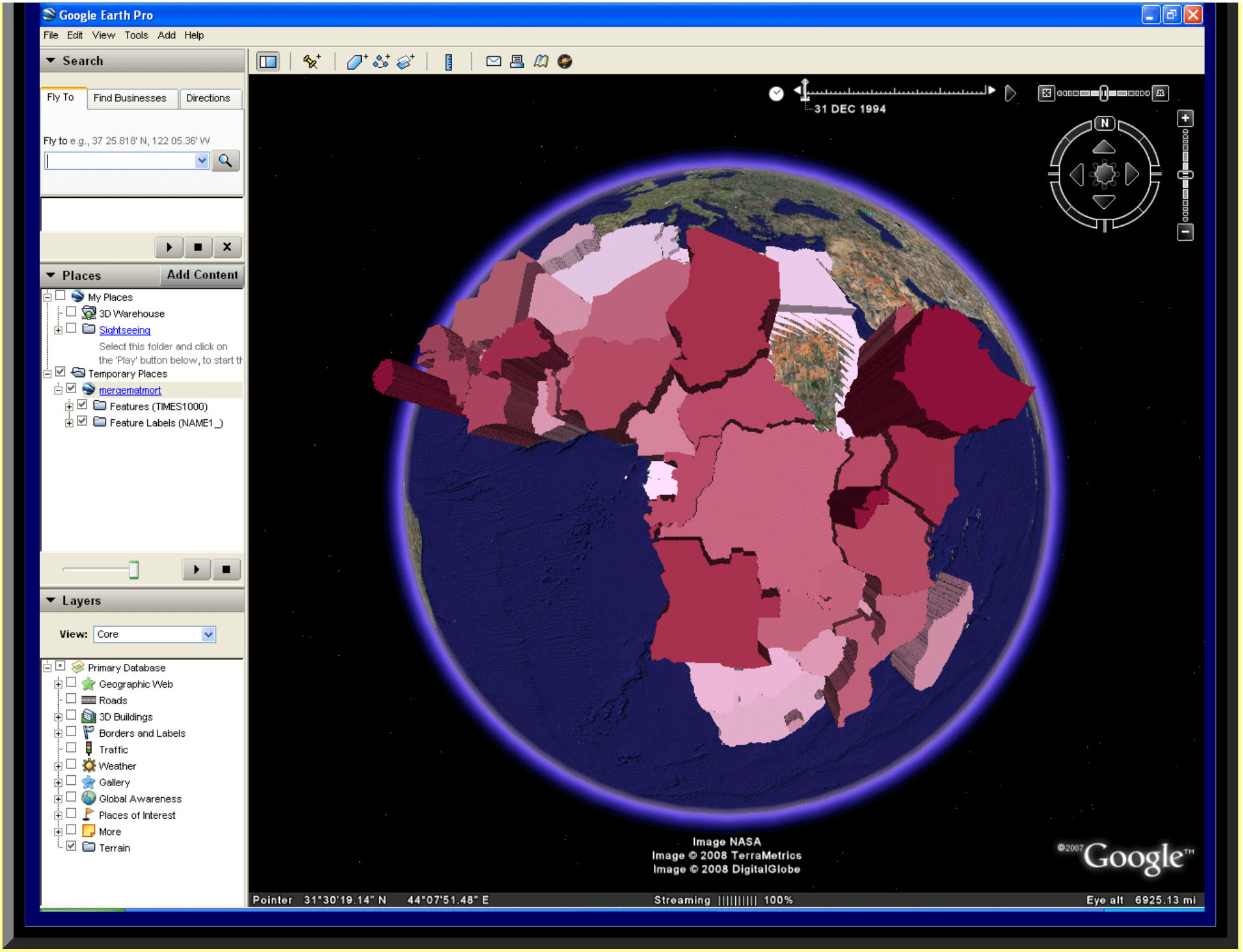
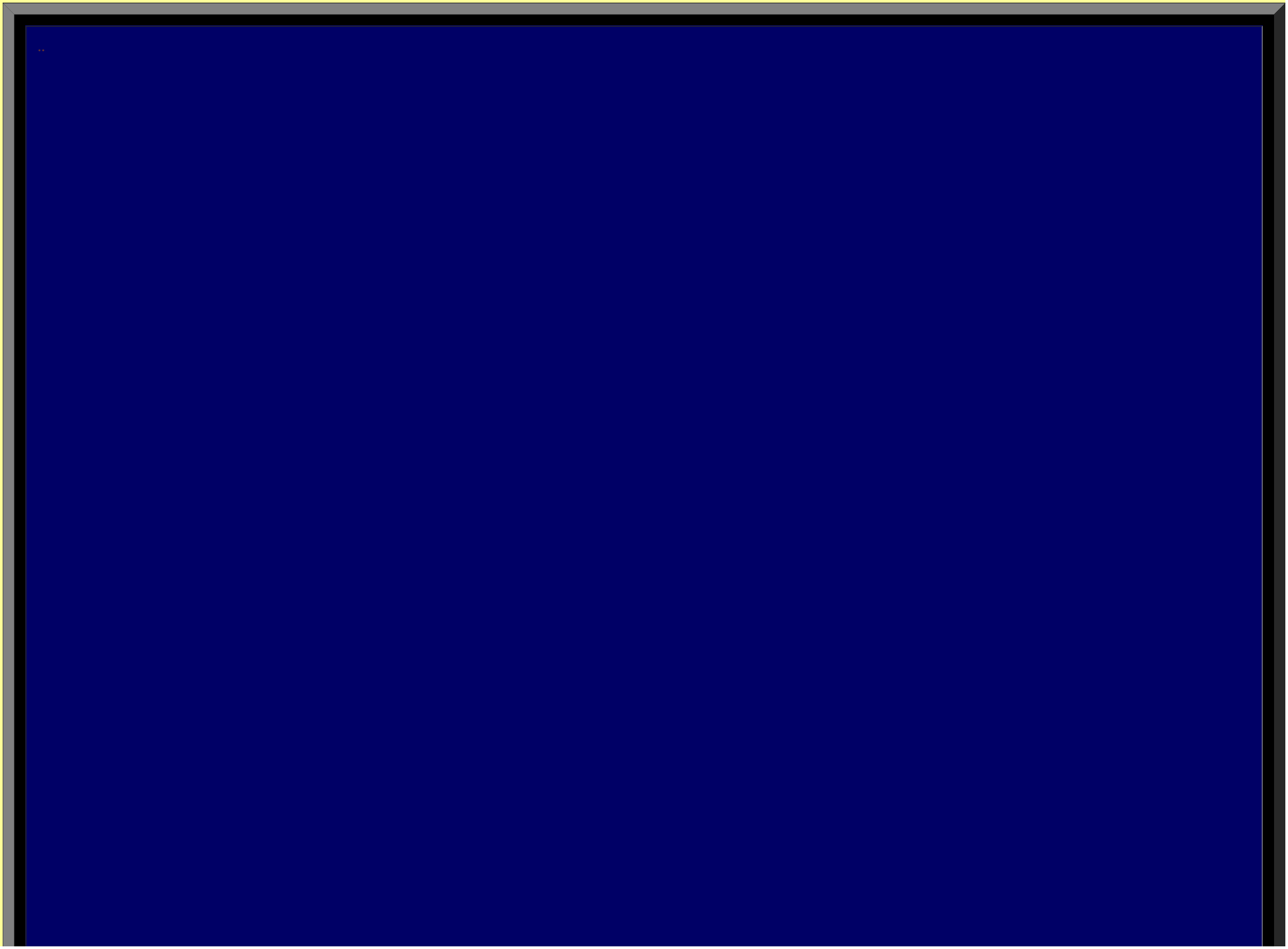

Google Earth Pro
File Edit View Tools Add Help
Search
Fly To
Find Businesses
Directions
Fly to e.g., 37 25.818' N, 122 05.36' W
Places
Add Content
My Places
3D Warehouse
Sightseeing
Select this folder and click on
the 'Play' button below, to start th
Temporary Places
mergematmort
Features (TIMES1000)
Feature Labels (NAME1_)
Layers
View: Core
Primary Database
Geographic Web
Roads
3D Buildings
Borders and Labels
Traffic
Weather
Gallery
Global Awareness
Places of Interest
More
Terrain
31 DEC 1994
N
Image NASA
Image © 2008 TerraMetrics
Image © 2008 DigitalGlobe
©2007 Google™
Pointer 31°30'19.14" N 44°07'51.48" E
Streaming 100%
Eye alt 6925.13 mi

FIGURE 5.2: Link to sequence of static shots composing this animation. The goal of this sequence of images is to show the reader one way to save files in Google Earth so that they appear in Google Earth when it is opened again after having been shut down.



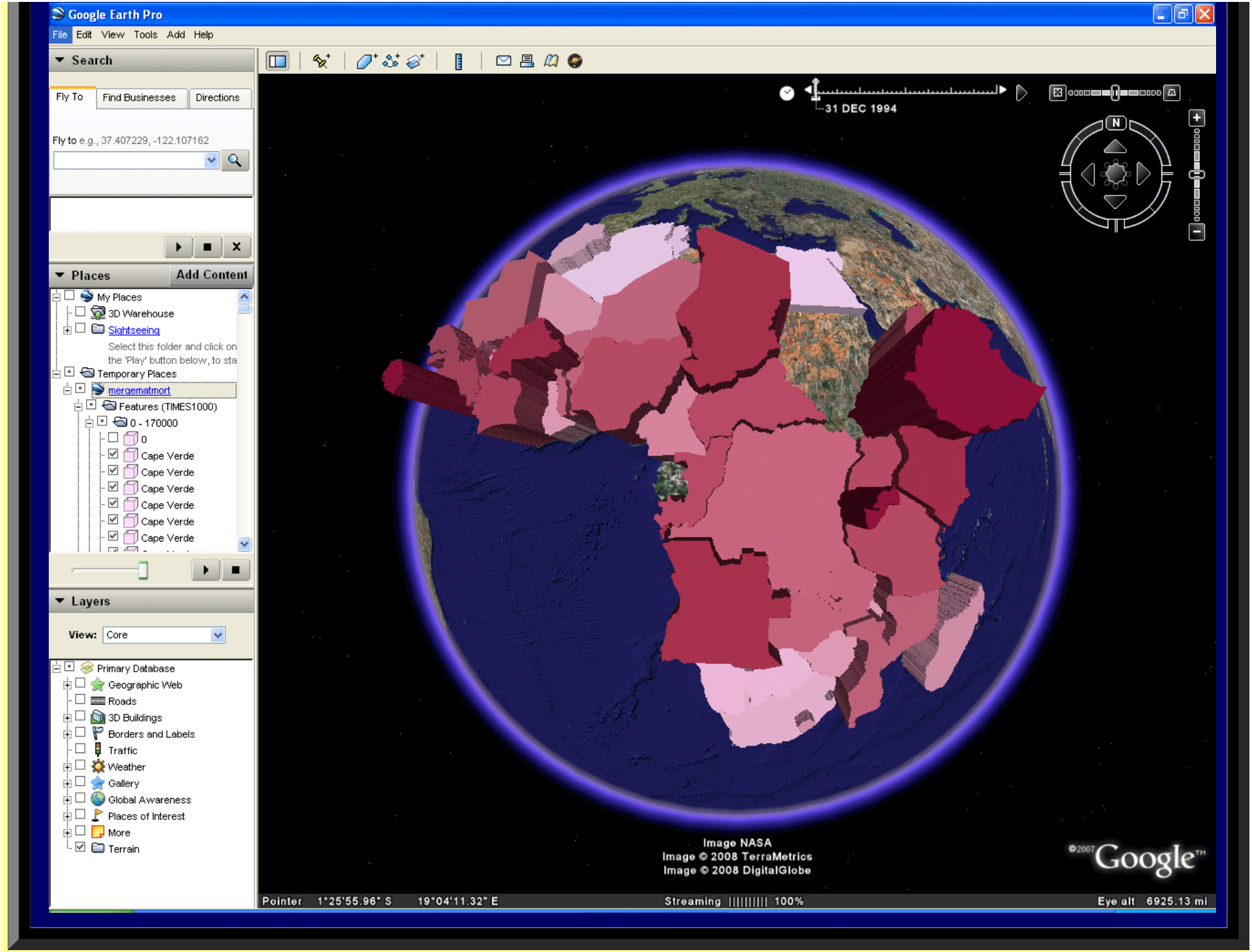
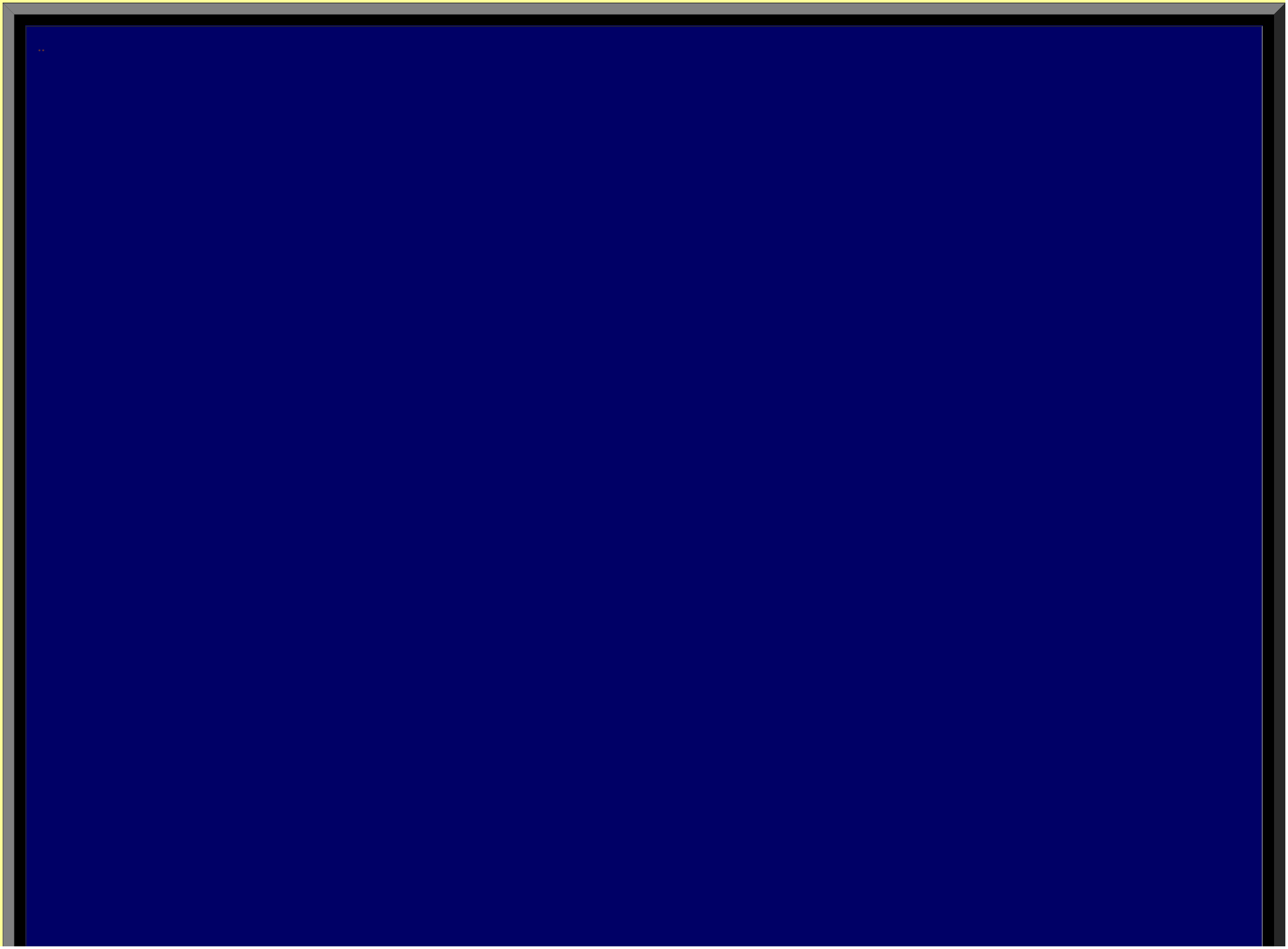
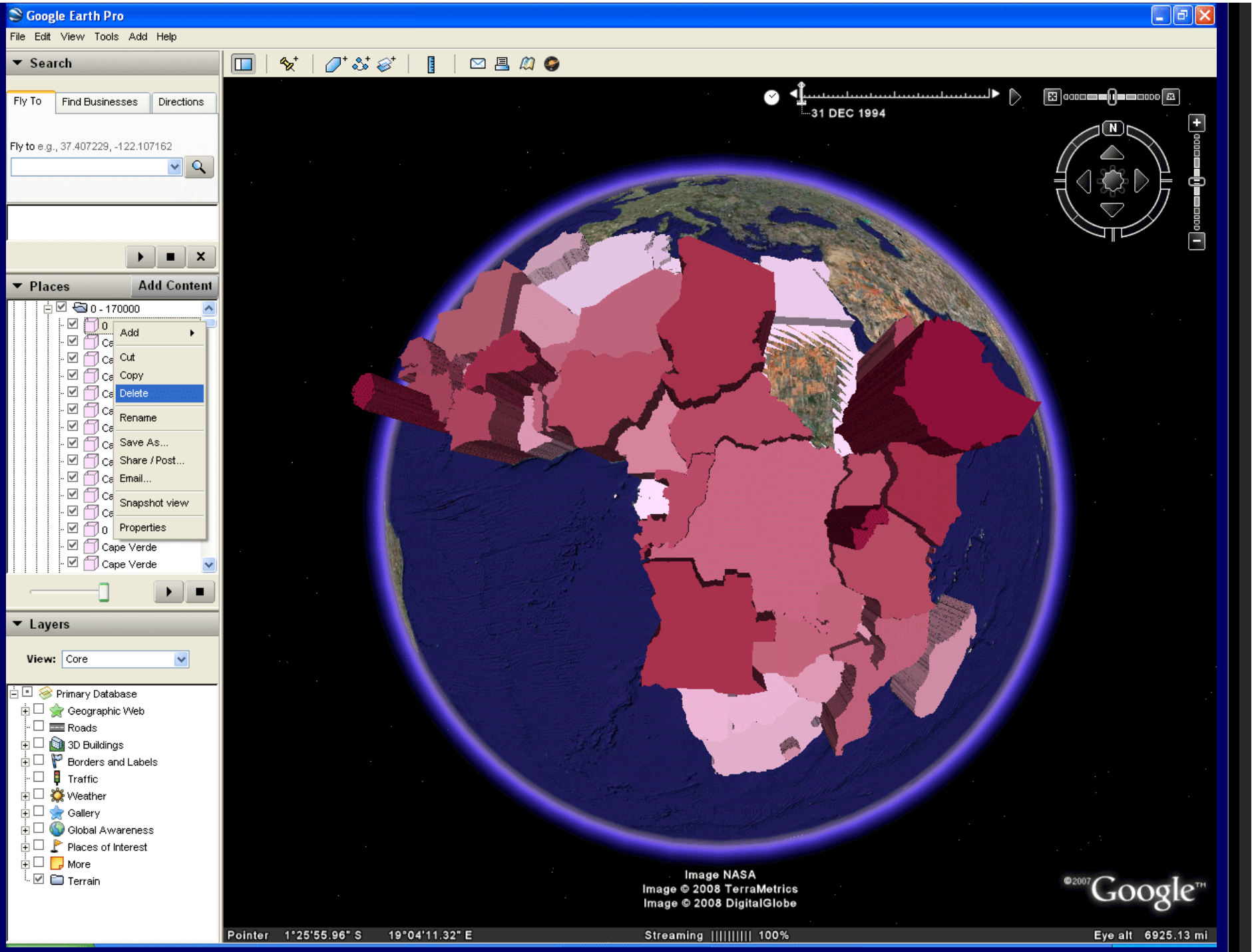

Google Earth Pro
File Edit View Tools Add Help
Search
Fly To
Find Businesses
Directions
Fly to e.g., 37.407229, -122.107162
Places
Add Content
My Places
3D Warehouse
Sightseeing
Select this folder and click on the 'Play' button below, to sta
Temporary Places
mergematmort
Features (TIMES1000)
0 - 170000
0
Cape Verde
Cape Verde
Cape Verde
Cape Verde
Cape Verde
Cape Verde
Layers
View: Core
Primary Database
Geographic Web
Roads
3D Buildings
Borders and Labels
Traffic
Weather
Gallery
Global Awareness
Places of Interest
More
Terrain
31 DEC 1994
N
Image NASA
Image © 2008 TerraMetrics
Image © 2008 DigitalGlobe
©2007 Google™
Pointer 1°25'55.96" S 19°04'11.32" E
Streaming 100%
Eye alt 6925.13 mi

FIGURE 5.3: Link to sequence of static shots composing this animation. The goal of this sequence of images is to suggest other ways to edit and save files in Google Earth so that they appear in Google Earth when it is opened again after having been shut down.





RESULTANT FILES:

- Maternal mortality ratio, edited kml
- Prevalence of underweight (moderate and severe)--Percent, Total < 5 yr., edited kml
- Primary Completion Rate, Rate, Total, edited kml
- Proportion of 1 year-old children immunised against measles, Percent, Total 1 yr., edited kml
- Proportion of births attended by skilled health personnel, Percent, Total, edited kml
- Proportion of population with access to improved sanitation, Percent, Total, edited kml
- Proportion of population with sustainable access to an improved water source, Percent, Total, edited kml
- Under-five mortality rate, Deaths per 1000 live births, Total, edited kml

FIGURE 5.4: Link **to sequence of static shots composing this animation. The goal of this sequence of images is to show how to open a kml file directly in Google Earth. In previous Figures, Google Earth Pro was launched. Here, the free Google Earth is used. The strategy for opening files is the same in either version.**

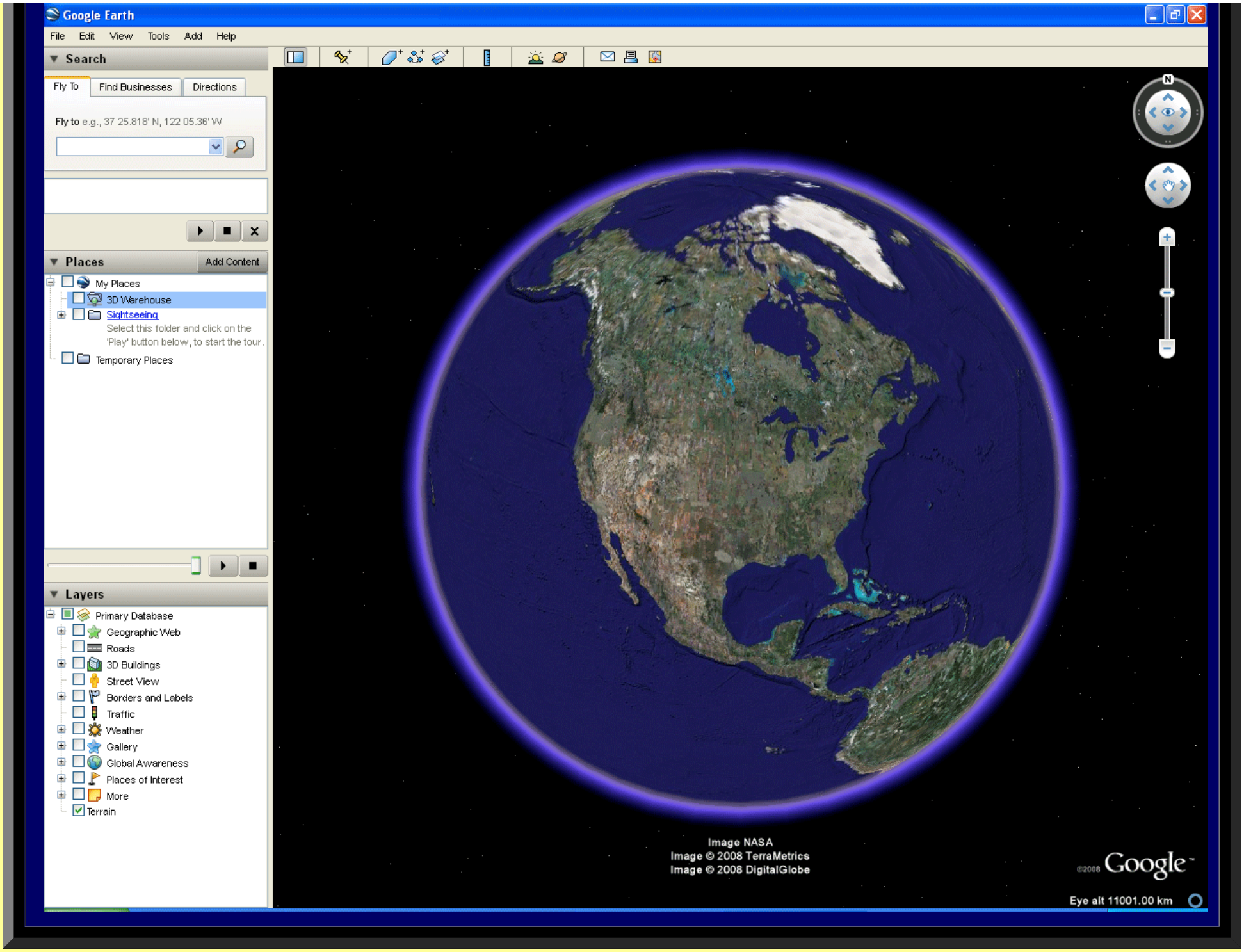

Google Earth
File Edit View Tools Add Help
Search
Fly To
Find Businesses
Directions
Fly to e.g., 37 25.818' N, 122 05.36' W
Places
Add Content
My Places
3D Warehouse
Sightseeing
Select this folder and click on the 'Play' button below, to start the tour.
Temporary Places
Layers
Primary Database
Geographic Web
Roads
3D Buildings
Street View
Borders and Labels
Traffic
Weather
Gallery
Global Awareness
Places of Interest
More
Terrain
Image NASA
Image © 2008 TerraMetrics
Image © 2008 DigitalGlobe
©2008 Google
Eye alt 11001.00 km

TABLE OF CONTENTS

Software used in analysis:

- DevInfo 5.0: http://www.devinfo.org/
- Adobe® PhotoShop and ImageReady
- Adobe® DreamWeaver
- ESRI:
  - ArcView® 3.2
  - ArcGIS® 9.2
    - ArcCatalog®
    - ArcMap®
- Google Earth®

Author affiliations:

- Arlinghaus, Sandra Lach. Adjunct Professor of Mathematical Geography and Population-Environment Dynamics, School of Natural Resources and Environment, The University of Michigan. Executive Committee Member (Secretary) Community Systems Foundation, sarhaus@umich.edu, http://www-personal.umich.edu/~sarhaus/
- Naud, Matthew. Environmental Coordinator and Assistant Emergency Manager, Systems Planning Unit, City of Ann Arbor
- Oswalt, Kris S. President, Community Systems Foundation
- Rayle, Roger. Scio Residents for Safe Water
- Lars Schumann. Manager and Research Computer Specialist, University of Michigan 3D Laboratory at the Duderstadt Center; also of Cornell University, Ithaca NY
- Arlinghaus, William C. Professor of Mathematics and Computer Science, Lawrence Technological University, Southfield, MI
- Arlinghaus, William E. General Manager, Chapel Hill Memorial Gardens, Grand Rapids, MI
- Batty, Michael. Bartlett Professor of Planning and Director of the Centre for Advanced Spatial Analysis (CASA) at University College London
- Haug, Robert. Ph.D. Candidate, Middle Eastern and North African Studies, The University of Michigan
- Larimore, Ann Evans. Professor Emerita, Residential College, The University of Michigan
- Longstreth, Karl. Head, Map Library, The University of Michigan
- Nystuen, Gwen L. Parks Advisory Commission; Environmental Commission; City of Ann Arbor
- Nystuen, John D. Professor Emeritus of Geography and Urban Planning, Taubman College of Architecture and Urban Planning, The University of Michigan. Chief Executive Officer, Community Systems Foundation

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Published by:
Institute of Mathematical Geography

http://www.imagenet.org
http://deepblue.lib.umich.edu/handle/2027.42/58219
August, 2008.

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€ ����������������W��ID_��������C���� ������������NAME1_����
C����@������������AREAID�����C���� ������������DATAVALUE��
C���� ������������BREAKVALUE�N���� ������������LABEL������C
����p������������COLOR������N���� ������������NAME2_������C
����@������������PARTS_������N���� ������������POINTS_����N�
��� ������������LENGTH_����N����
  ������������AREA_������N����
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����������SUBPOP�����C����@������TIMES1000��N���� ��
����������ENDDATE����C���� ������

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2.00000581 - 980
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15136253.00000TUN 6 7875 1935.813000 60415.8700001995 Total
700002008 AFRTGO Togo AFRTGO 980 2.00000581
- 980
42911998.00000TGO 1 1212 1073.306000 22283.2100001995 Total
9800002008 AFRTCD Chad AFRTCD 1500
4.000001201 - 2300
3644415.00000TCD 1 3161 3771.940000493343.3000001995 Total
15000002008 AFRSYC Seychelles **********
**********SYC 5 180 95.768830 95.962070
********** AFRSWZ Swaziland
****
**********SWZ 1 212 341.807700 6741.040000
********** AFRSTP Sao Tome & Principe
****
**********STP 5 280 141.097500 392.046200
********** AFRSOM Somalia
****
**********SOM 13 2333 3657.525000244209.300000
********** AFRSLE Sierra Leone AFRSLE 2100
4.000001201 - 2300
3644415.00000SLE 3 4188 1883.093000 28119.7400001995 Total
21000002008 AFRSHN St. Helena **********
**********SHN 4 81 102.193200 155.941700
********** AFRSEN Senegal AFRSEN 1200
3.00000981 - 1200
40022526.00000SEN 1 3633 2010.621000 76945.2700001995 Total
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**********SDN 7 5125 5497.415000949227.800000
********** AFRRWA Rwanda AFRRWA 2300
4.000001201 - 2300
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23000002008 AFRREU Reunion **********
**********REU 1 44 120.555800 1026.811000
********** AFRNGA Nigeria AFRNGA 1100
3.00000981 - 1200
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11000002008 AFRNER Niger AFRNER 920
2.00000581 - 980
42911998.00000NER 1 4473 3540.086000453048.4000001995 Total
9200002008 AFRNAM Namibia AFRNAM 370
1.0000070 - 580
15136253.00000NAM 7 3696 3526.865000329243.1000001995 Total
3700002008 AFRMYT Mayotte **********
**********MYT 2 51 74.889970 174.467300
********** AFRMWI Malawi AFRMWI 580
1.0000070 - 580
15136253.00000MWI 3 1595 1798.060000 45478.0000001995 Total
5800002008 AFRMUS Mauritius **********
**********MUS 15 1134 222.267700 823.817500
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********** AFRGIN Guinea AFRGIN 33
4.0000032 - 47
3644415.00000GIN 16 3984 3077.610000 95625.8900002001 Total <5 yr
330002008 AFRGHA Ghana AFRGHA 25 2.0000019 -
25
42911998.00000GHA 1 1824 1672.312000 91969.1300002001 Total <5 yr
250002008 AFRGAB Gabon **********
**********GAB 4 2574 2213.024000102900.400000
********** AFRETH Ethiopia AFRETH 47
4.0000032 - 47
3644415.00000ETH 1 3348 3389.897000429509.3000002001 Total <5 yr
470002008 AFRESH Sahrawi **********
**********ESH 1 846 1885.253000101791.100000
********** AFRERI Eritrea
****
**********ERI 345 8750 3073.324000 47433.090000
********** AFREGY Egypt AFREGY 4
1.000004 - 18
15136253.00000EGY 515276 4236.262000401626.9000002001 Total <5 yr
40002008 AFRDZA Algeria AFRDZA 6 1.000004 - 18
15136253.00000DZA 4 7442 5087.006000933061.2000002001 Total <5 yr
60002008 AFRDJI Djibouti **********
**********DJI 1 569 544.790300 8409.849000
********** AFRCPV Cape Verde
****
**********CPV 12 1012 554.557700 1533.394000
********** AFRCOM Comoros
****
**********COM 3 6548 273.731100 639.547600
********** AFRCOG Congo
****
**********COG 1 3120 2868.848000132673.200000
********** AFRCOD Congo DR
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**********COD 1 7225 6407.503000908291.800000
********** AFRCMR Cameroon AFRCMR 22
2.0000019 - 25
42911998.00000CMR 7 4505 3513.146000182086.1000002001 Total <5 yr
220002008 AFRCIV Cote d'Ivoire AFRCIV 21 2.0000019 -
25
42911998.00000CIV 2 2916 2278.587000124949.0000002001 Total <5 yr
210002008 AFRCAF Central African Republic
****
**********CAF 1 4453 3393.298000241806.100000
********** AFRBWA Botswana AFRBWA 13
1.000004 - 18
15136253.00000BWA 112238 2611.988000230729.9000002001 Total <5 yr
130002008 AFRBFA Burkina Faso AFRBFA 34 4.0000032
- 47
3644415.00000BFA 1 3118 2139.488000106425.8000002001 Total <5 yr
340002008 AFRBEN Benin AFRBEN 23 2.0000019 -
25
42911998.00000BEN 1 1774 1303.677000 44749.3000002001 Total <5 yr
230002008 AFRBDI Burundi AFRBDI 45 4.0000032 -
47
3644415.00000BDI 1 1686 636.302500 10461.1700002001 Total <5 yr
450002008 AFRAGO Angola AFRAGO 20 2.0000019
- 25
42911998.00000AGO 2 4631 4458.631000486869.2000001990 Total <5 yr
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