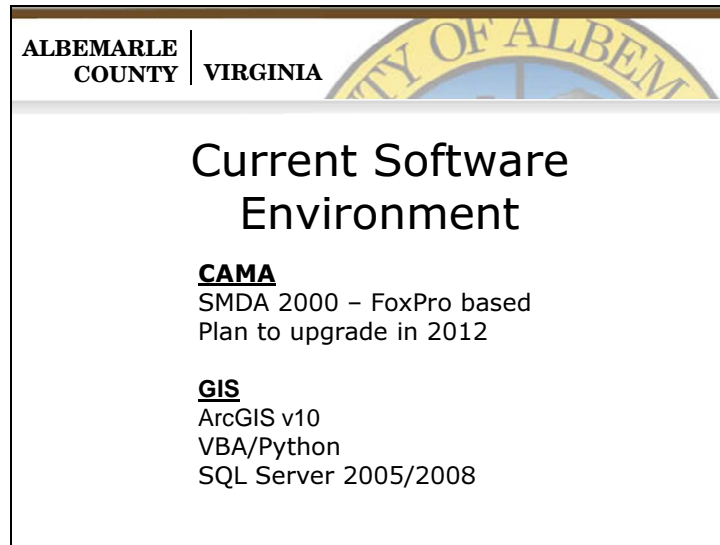


Hello, my name is Damon Pettitt and I'm the GIS Coordinator for Albemarle County local government. I'm based out of the Office of Geographic Data Services, which is located within the Community Development Department.

I'm co-presenting today with Ty Chambers, the CAMA/GIS Coordinator at Albemarle County who works in our Real Estate Office, which is located within the Finance Department.

Let me start by saying that I encourage you all to ask questions at any time. We have 90 minutes and I think we can spend a fair amount of time on any questions you may have.

For today's presentation, we'll be focusing on a particular ArcGIS tool that the Real Estate Office uses to determine Land Use Taxation valuation information. This is just **one** method we use to control the quality of data that flows into our CAMA system.



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Current Software Environment

CAMA
SMDA 2000 – FoxPro based
Plan to upgrade in 2012

GIS
ArcGIS v10
VBA/Python
SQL Server 2005/2008

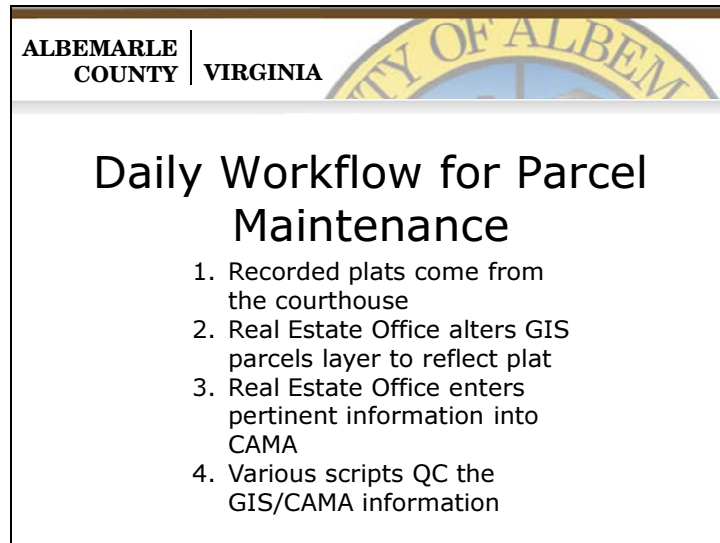
Before I get into this particular application, however, I do want to briefly highlight our current software environment.

Since about 2001, with the creation of our first GIS parcel layer and our first foray into using ESRI's ArcGIS software, we've been gradually improving the quality of the data flow into our CAMA.

This presentation will showcase ESRI technology.

A show of hands on who currently uses ESRI's ArcGIS software or works for an entity that may use it in another office.

A show of hands on who plans on using it in the future.



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Daily Workflow for Parcel Maintenance

1. Recorded plats come from the courthouse
2. Real Estate Office alters GIS parcels layer to reflect plat
3. Real Estate Office enters pertinent information into CAMA
4. Various scripts QC the GIS/CAMA information

I also want to discuss our current Daily Workflow for Parcel Maintenance

- **Recorded plats come from the courthouse**

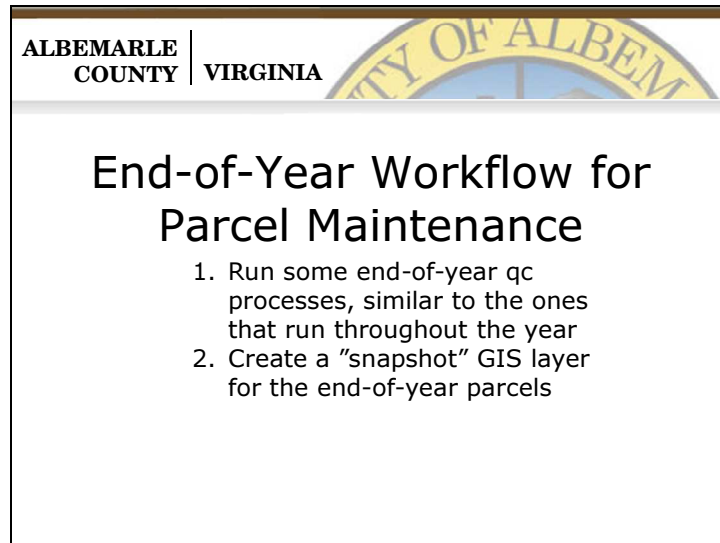
These come on a flow basis through a digital system from the courthouse (COTS). Currently, Real Estate staff makes hardcopies of scanned plats. This represents an area for improvement in the sense that it would be better to have this process be entirely electronic. Even better would be the requirement for plats to be submitted digitally, as a vector based layer stored in a real world coordinate system. That way, we could eliminate a huge source of geographic inaccuracy at the beginning. Currently, we do require 4 geographically located control points on certain plats, but this process has limited value, although it can be helpful in certain situations. Additionally, from time to time, especially for large subdivisions, we will work with the developer/surveyor to acquire the digital plat for the parcel boundaries, thus saving a huge amount of time, and improving the overall accuracy of the parcel geography.
- **Real Estate Office alters GIS parcels layer to reflect plat**

Use ArcMap (control points, metes and bounds, digital files)
Checks topology
Alters neighboring parcels as appropriate (this is where having the ability to, at a glance, see how "off" an existing parcel's GIS acreage is from its deed acreage can be very useful as it can inform to what extent the updating of neighboring parcels needs to be).
- **Real Estate Office enters pertinent information into CAMA**

Owner Name, tax map id, deed acreage, gpin value

- **Various automated scripts QC the GIS/CAMA information**
 - 1) Locates blank or null PIN/GPIN values
 - 2) Finds any duplicate PINs/GPINs
 - 3) Finds mismatches between the GIS parcels layer and tabular information
 - 4) Finds polygons that may be so small they may in fact be slivers (these don't get caught through the topology checker)
 - 5) Finds discrepancies between deed acreage values between GIS table and the CAMA table
 - 6) There's also a script that automatically checks the topology in case someone forgot to do this manually

There's also another way that prompts the Real Estate Office to make parcel changes and that is when somebody (public, staff, et al.) has reason to believe that digitized parcel boundaries are incorrect. And we will have a lot of incorrectly drawn parcels by virtue of the fact that nearly all of the parcels were drawn using a "best-fit" methodology that uses scanned tax map sheets and aerial photography to determine where parcel boundaries are. The incorrectness becomes more pronounced for larger, rural parcels that have few features that allow somebody to figure out where a property line is by only using the aerial photograph as a guide.



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End-of-Year Workflow for Parcel Maintenance

1. Run some end-of-year qc processes, similar to the ones that run throughout the year
2. Create a "snapshot" GIS layer for the end-of-year parcels

Current End-of-Year Workflow for Parcel Maintenance

- **Run some end-of-year qc processes, similar to the ones that run throughout the year**
- **Create a "snapshot" GIS layer for the end-of-year parcels**
We have these going back to 2001.
We've considered other options (sde archiving, etc.), but creating separate, standalone snapshots seemed like the best approach in terms of maintenance and complexity.

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What are we trying to solve?

The image is a composite graphic. At the top left, it says 'ALBEMARLE COUNTY VIRGINIA' next to a partial logo of the University of Albemarle. Below this is the question 'What are we trying to solve?'. The main part of the image is a collage. On the left, there's a small photo of a person in a green shirt using a handheld planimeter on a map. In the center, a large yellow arrow points to the right, with the text 'Upgrading over time...' written across it. On the right side, there are two overlapping windows. The top one is a VBA script editor for 'VBAProject (CAMA_LandUseAssesment.vba)'. The bottom one is a Notepad window showing a VBA script. The script includes comments in Chinese and VBA code for processing parcel data, such as 'Public Sub Main()', 'Dim p as Parcel', and 'MsgBox = [*****]'. The script appears to be a tool for automating the land use assessment process.

So, we've gone over our current software environment and the daily and end-of-year processes that go into maintaining a GIS parcels layer... Now let's talk about how the land use taxation application fits into this.

This application, also called DLUAA (Digital Land Use Assessment Application), transformed how Real Estate determined land use taxation valuation for parcels under and applying for land use.

Before this semi-automated tool was developed, County staff would use outdated blueprints of aerial photography and soils, a mylar overlay of parcel boundaries, and a handheld planimeter to determine the acreage values of different soil classifications based on whether they were in agricultural, forestal, or horticultural use (e.g. apples, peaches).

The process was tedious and error prone and generally not very efficient (or fun).

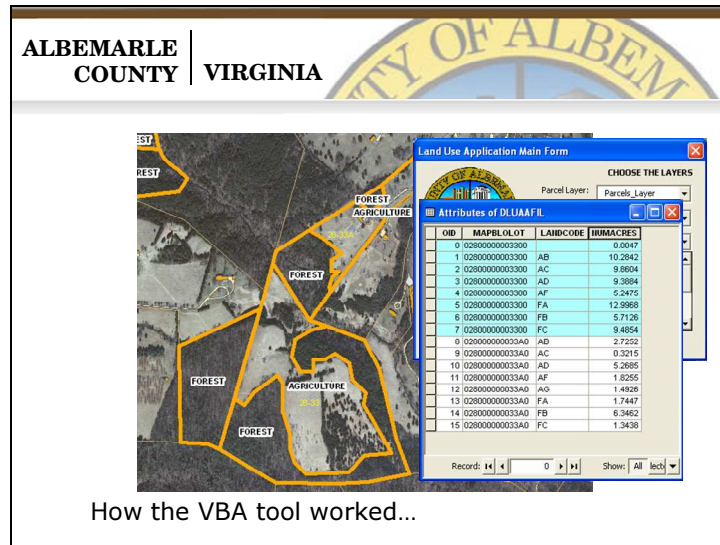
Then a few years after our first digital, GIS parcels layer was developed for parcels as of 12/31/2001, which roughly coincided with the acquisition of ArcGIS software, the GIS office began to create a VBA tool in ArcMap that gave Real Estate staff the ability to heads up digitize the agricultural/forestal/horticultural delineations for a given parcel and derive the acreage breakdowns for the different types of soil classes for each of these land uses. These values, in turn, could be used to enter information directly into the CAMA database tables where the valuation process could take place.

The VBA tool has greatly improved the efficiency of this process.

With ArcGIS 10.1 doing away with VBA, however, this tool will need to be redone. We are planning to migrate this tool to code written using ESRI's arcpy module within Python.

We could have used ESRI's Add-In technology (new in ArcGIS v10), but the learning curve is similarly steep as the VBA learning curve and we already had a lot of experience developing Python scripts for other GIS tasks. In fact, you could use VB.NET to create an Add-In that would be very similar to the VBA tool and could even re-use most of the VBA code within the VB.NET code base, but again, we've decided to use this opportunity to migrate the code base to an easier format. This easier format is also good b/c more staff people could manage it than if it were on a VB.NET code base.

A show of hands for those of you who knows what Python is?



So, let's compare the workflows of the VBA tool vs. the Python tool. Here's a visual of how the VBA tool worked...

But first, let's take a moment to discuss how we deal with acreage values when we have a deed acreage value that may or may not be the same as the GIS acreage value.

When dealing with portions of parcels as part of our analysis, we deal in "GIS acreages" not deed acreages.

Q. So how do we ensure that whole or pieces of parcels total up to equal the deed acreage value?

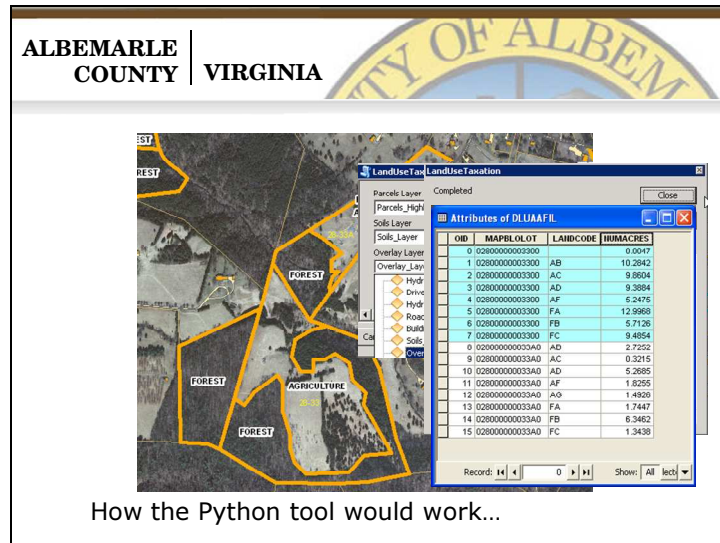
- We come up with a coefficient (deed acreage divided by GIS acreage) that represents the multiplier to use for whatever parcel we're dealing with.

For example, if we have a parcel whose deed acreage is 40 and the GIS calculated acreage is 38, then our coefficient would be $40/38$ or 1.05. So for every portion of that parcel, we need to multiply 1.05 to the GIS acreage to yield the equivalent deed acreage. We're essentially dealing in percentages. A portion of a parcel may be 25% of the whole parcel – and we assume this portion is 25% of the whole parcel regardless if the deed acreage and GIS acreage values disagree. Using the multiplier is our way to bridge the inevitable difference in the two values.

VBA

So now let me provide you with the workflow used with the VBA tool.

- User heads up digitizes the “overlay” layer, i.e. uses digital, aerial photography overlaid on the GIS parcels layer to determine where the different use types are (forestal, agricultural, horticultural) for a given parcel or parcels.
- Ensuring that these same parcels are selected, the user then clicks on a button in ArcMap to bring up a dialog box.
- Within the dialog box, the user chooses which GIS layers already loaded on the map will be the parcel layer, soils layer, overlay layer, and whether they want a PDF output or not.
- After clicking the “GO” button, the application:
 - Checks to make sure the overlay layer doesn’t have any blanks and ensures a parcel(s) is selected.
 - Assuming all is well, it then performs select by location whereby we are selecting the soil and overlay features that intersect the selected parcel(s). As it combines the parcels layer, soil layer, and the overlay layer, it knows what type of LANDCODE value to give it (e.g. FA, FB, AA, AB, etc.) based on the soil classification and overlay values (forest, agriculture, etc.).
 - It then has to Dissolve based on common values (PIN + LANDCODE).
 - It then spits out a table (deals with rounding errors) that staff uses as a reference to update CAMA land values.
 - Optionally, it creates a PDF showing the different land use codes on the parcel(s) in question.



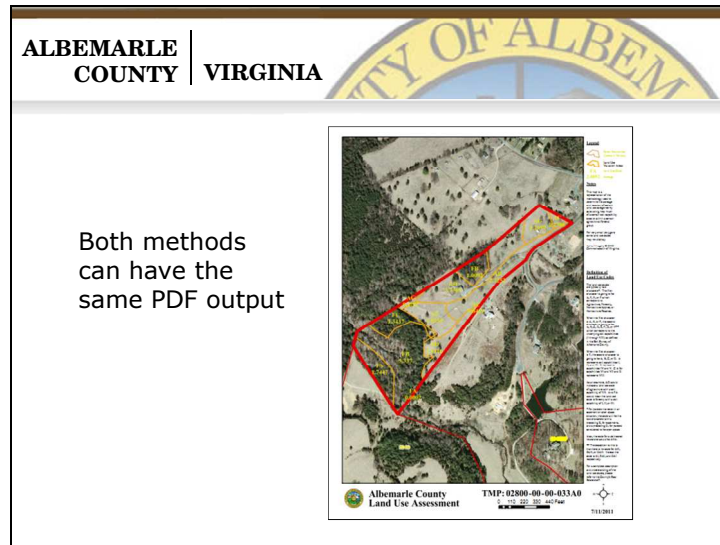
Python

Now here's a visual of how the Python tool could work...

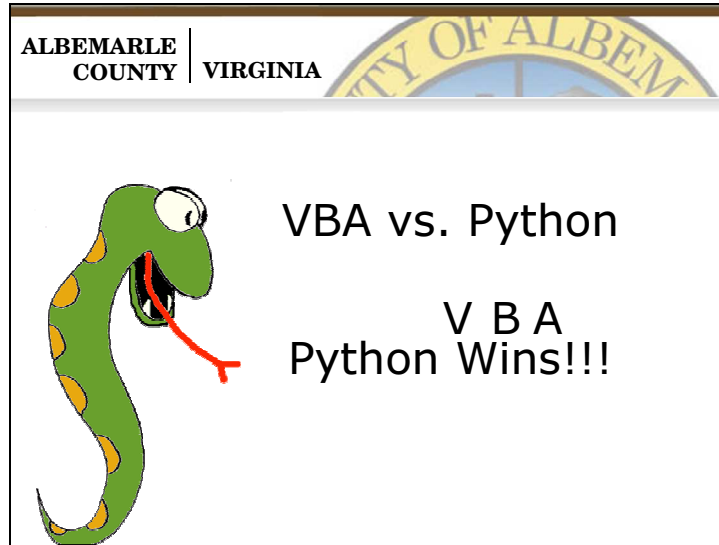
- Can do the pre-checks as the VBA tool to ensure we have a selected parcel and there are no issues with the data layers we're working with. Because we're dealing with python, it's far easier than in VBA to come up with new checks that might have been too complex in VBA.
- Assuming all is well, we perform an Intersect (instead of a Union process like in the VBA code) whereby we use selected parcel(s), soils layer, and overlay layer to essentially create a table that staff can use to update CAMA.
- We can also create a PDF map as before.

Using Python, as well as a new CAMA system, may allow us to more easily bring this data into CAMA in an automated fashion.

We could also send e-mails to administrators indicating which parcels have undergone this valuation process, and possibly create a report that could be sent to the land owner as part of a mail merge.

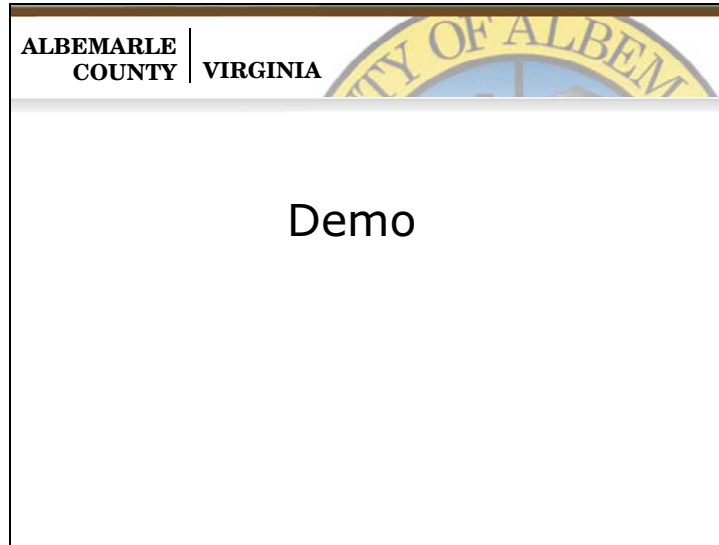


And both methods could have the same PDF output which could be beneficial in that the end user wouldn't see any change in the final maps. Therefore, a level of continuity is maintained even though the code base is very different.



So as we saw, we don't lose anything when we have to update this application to python.

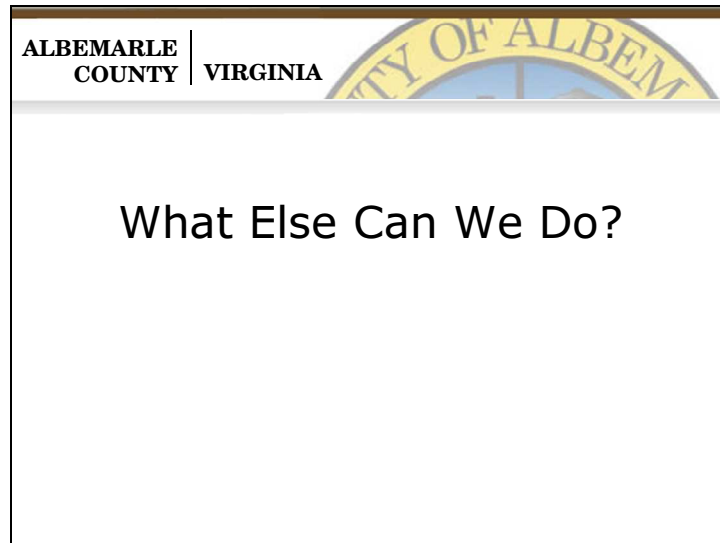
Slide 10



Demo for the ArcPy version and/or show people how to set up the Toolbox
Can use the following as a guide to figure out how to create the dialog box for use in
ArcMap that supplies the user-entered parameters to the python program:
<http://www.esri.com/news/arcuser/0111/charmsnake.html>

Could show Ty's MXD that shows how far a parcel is off from its Deed Acreage as
compared to its GIS Acreage.

Other things to show???



Show the 2009 Landcover layer to show how improvements in delineation could be realized for land use taxation valuation.

Mention that somebody could do field work and see where somebody wants to add a new vineyard, GPS the extents, and then back in the office run the overlay tool on it to determine the land valuation changes for that parcel.

You could see how other “overlays” could be used in a tool similar to this as well. And these overlays wouldn’t even need to be manually created by staff in the Real Estate Office. For example, you could have a GIS zoning layer or impervious surface layer that could be used to split up a parcel based on zoning values or impervious surface features. The parcel’s assessment could reflect the different valuations assigned to different zoning classifications or quantity of impervious features.

Even if you can’t currently envision how this tool could be applied elsewhere, it employs techniques that can be built upon to eventually, one day, lead you to creating another tool that could greatly impact your efficiency as an organization. And with each subsequent tool creation, your efficiency gains (and knowledge base) grow and grow. All subsequent scripts build off this initial experience.

Any other ideas people may have?

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Questions?

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