Forest METRIX

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EASY MAPPING FOR LAND TRUSTS

An unbiased review of options to cut through the confusing world of pro mapping systems.

Who We Are

Forest Metrix makes software integrating apps, maps and desktop database workflow.

Started 5 years ago, the firm makes the leading system for foresters and one of the leading systems for arborists.

Our Protected Lands Management system is borne out of a passion project conducted by colleagues sharing long histories of involvement with conservation.

More info: www.forestmetrix.com

NEW ERA:

MAPS FOR NORMAL PEOPLE

FINALLY, THERE ARE APPS FOR THAT

Most people working for land trusts need a few straightforward mapping capabilities. They need to be able to pin down the locations of points of interest and display them on maps, preferably with base maps (like photos) displayed underneath, and preferably with some flexibility with how they are labeled.

They also need to ensure their data integrates with their larger data sets, which can be in different formats and actually measure different things. This is sometimes difficult to understand and difficult to develop workflows and systems that meet the competing needs.

This whitepaper describes the most common mapping systems out there and shows what is needed for today's land trust professional, with the expectations that come with a rapidly developing mapping software industry.

Today, special software made for protected land managers can handle this simply, without additional charges or training. These systems include a comprehensive database of points of interest, stewardship observations, and other things beyond maps. These comprise a new class of **"post-GIS" systems** that are coming to dominate day-to-day mapping needs.

Even some free consumer web services now provide much of this mapping functionality. Google Maps is a popular example, where users can create custom maps and share them. Land databases that use open standards can export data to this sort of platform, potentially providing the best of both worlds.

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COLLECTING DATA

There are lots of ways to collect location data. It is easy to feel pressure to invest in costly hardware to get accurate locations. For the purposes of most land trust use, though, simpler and cheaper methods - such as just touching a digital basemap provided by Google - are much easier and at times even provide more accurate real-world data.

MOST COMMON METHODS

REGULAR GPS

This is the simplest. The GPS device fixes a location. It is typically only about +/- 20 feet accurate. This works for most people when points are not generally too close together.

AIDED GPS

GPS devices can be aided by additional devices that make the GPS readings more accurate. An example is the Bad Elf bluetooth device. These are generally about +/-12 feet in accuracy.

SUBMETER GPS

These systems require expensive hardware, sometimes subscriptions to streaming data, and sometimes a need to conduct post-processing on the data after the field visit. They can provide very accurate data, although they are not (yet) considered a replacement for survey measurements.

TOUCH MAP

Maps have gotten easy, with many free services online and offline to take GPS points and make useful and interactive pictures, and with basemaps beneath. They allow users to simply touch the map to have the system calculate an accurate location. Most such applications generally give you 1 to 3 feet accuracy.

Simply using an on-board GPS chip on your existing device, whether it be your smartphone or iPad, doesn't cost anything additional. These typically take less than a minute to produce a location.

Additional hardware, such as bluetooth devices made to increase GPS accuracy generally cost a few hundred dollars and roughly

double the accuracy of the locations (see device at right).

Submeter GPS units vary quite a lot in both price and degree of accuracy, depending on the hardware, and depending on how that hardware is employed. To get true sub-meter results, one must often use external aerials, take multiple readings over different timespans and bring the data back to the office to be processed. Some systems also rely on ground-based broadcast stations, which are available only in certain regions. To move to this level of accuracy takes significant funds and time on an ongoing basis, so should be based on a real need.

Recently launched by Forest Metrix, the Touch Map feature allows a user to simply look at a basemap from Google and touch the right place (see right). That allows the system to calculate a location based on the geo-located map underneath. Accuracy is typically between 1 and 3 feet. The service does not cost any additional money, but it does require internet access to work. In areas without internet access Forest Metrix reverts to GPS or aided GPS use. A comparison of methods and accuracy can be seen below.

ACCURACY VERSUS COSTS

Accuracy (+/- feet)

www.forestmetrix.com
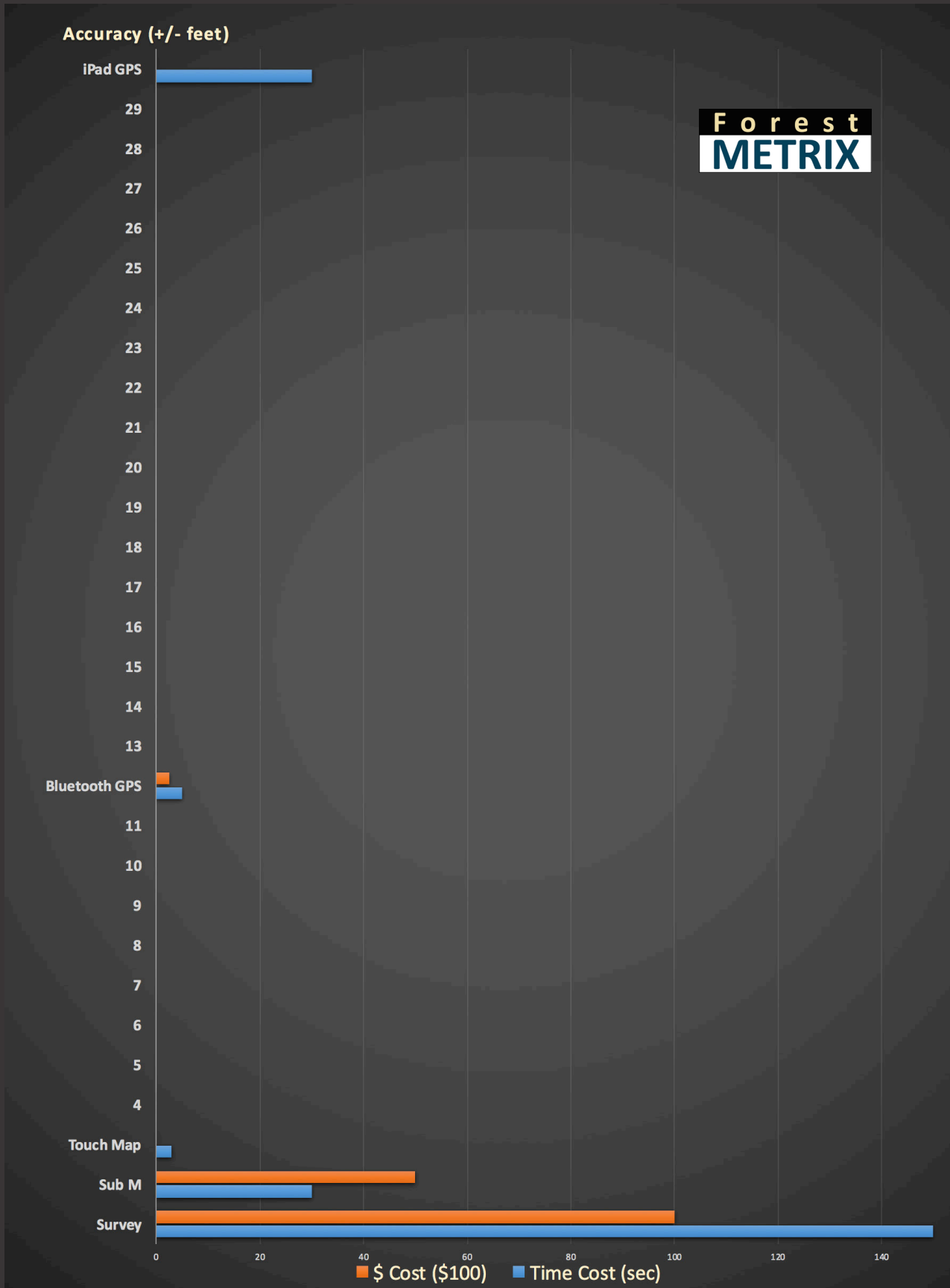
DIFFERENT SYSTEMS TO STORE MAP DATA

Survey Crew

CAD

GPS

GIS

Guy w/ iPad

Tree System
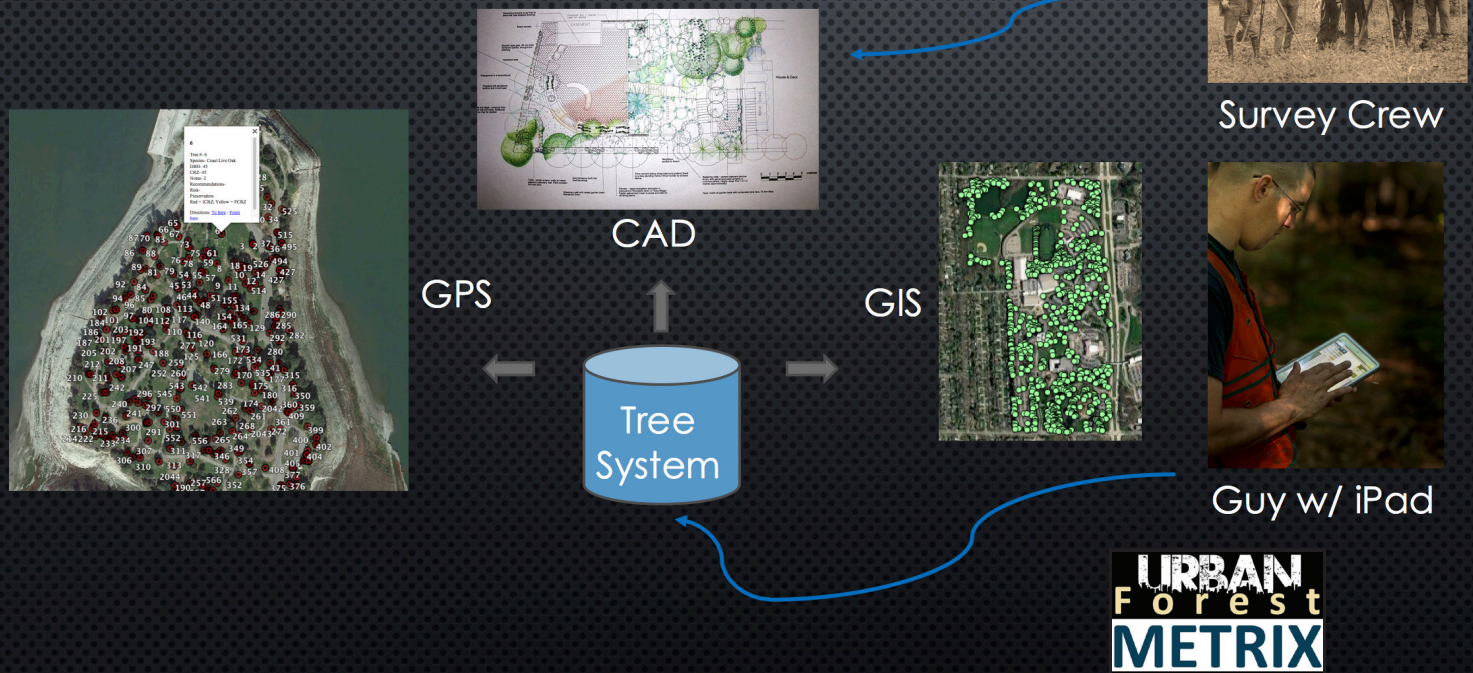
AT THE CENTER OF IT ALL...

A DATABASE

GPS data is collected to provide reference to locations. This data might be simply put in a spreadsheet. It may be put into a "geographic information system" (GIS), which can create a more sophisticated set of layers of information, but it is complex and difficult to use. Alternately, a survey crew can locate points of interest and put those locations into a "CAD system" which is a type of drawing program often used by architects and construction engineering firms. Unfortunately, the data from these types of systems don't allow for mixing of the two, as they are most commonly used in a way that does not share common reference points.

Nowadays, the data is increasingly kept in a database designed for professionals. It is then the job of the software to prepare data that can be exported to these various mapping systems, depending on the need. This is the new advance that land trusts previously couldn't do, forcing them to use expensive and time consuming processes.

REPRODUCEABLE, EDITABLE MAPS

Land trusts are better off having their own databases of properties and location information. This allows them to produce the types of maps that they wish to make at the moment, rather than having to rely always on a general map of the property, or one that only shows the most recent information. Having a database allows the selection of which points of interest (POIs) should show up on a map, how they are labeled, and even provide interactivity online, allowing staff and landowners to be able to click on icons to bring up more information about that POI. Data can be exported to the other databases, such as a state's conservation GIS system.

Because mapping programs are advancing so quickly, the mapping engine in any specific piece of software is likely to be limiting over the long-term. Systems that export map information into the fast-developing world of online mapping services already provide more complete capabilities.

Maps can be made publicly accessible, with certain data made visible and other information kept secure. More and more municiple landowners seem to desire that sort of access. The land trust retains the data in a system that allows for much better management of stewardship, updates and can even show the evolution of stewardship issues over time.

Points of Interest Report

Map

Live Data Map

Property Database

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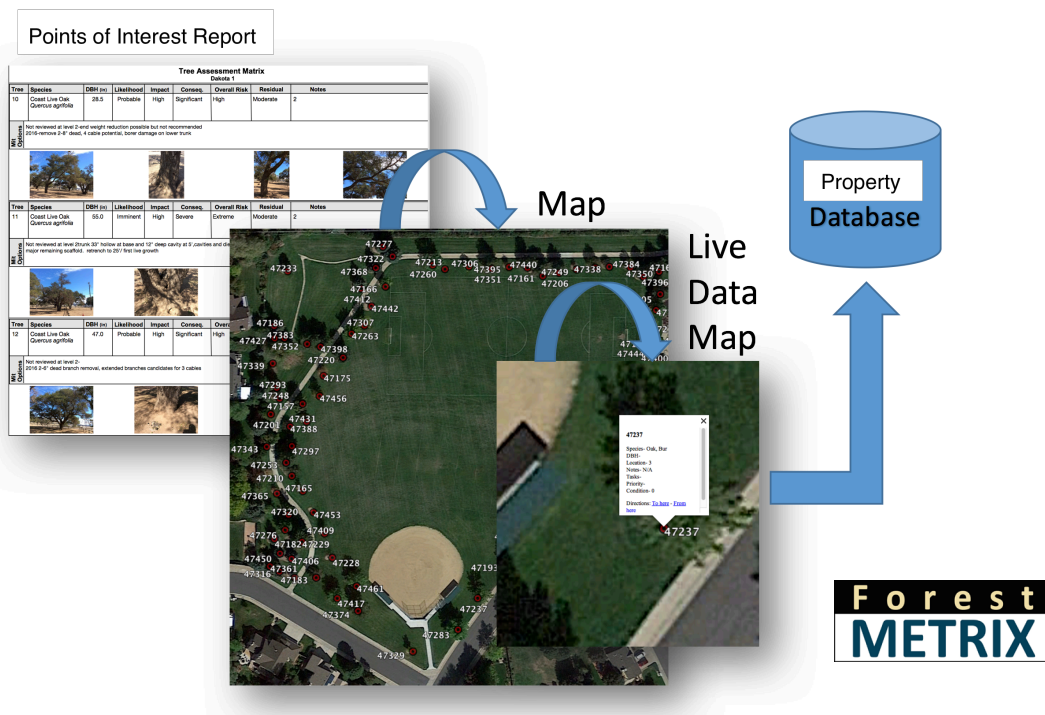
MARRYING COMMON SYSTEMS

Land trusts might have a municipal landowner that provides boundary pins in data from a GIS system. A donor might have hired an engineering firm to conduct a survey, and their information lives in CAD software. Still other partners won't want to deal with the hassle or expense of either system, and just want to link to interactive maps on the internet.

HUMANS NEED TO MAKE THESE DETERMINATIONS

A real person - not a computer - needs to determine what is the best data format for a particular property. A conversation needs to happen early on to know what input is available and what the output needs to be.

AUTOCAD

Autocad is self-referential. In other words, the location data - as used by most surveyors - is only placed relative to the other structures in the document, not to a fixed position on the planet Earth.

GIS

GIS systems, such as ArcGIS can hold multiple layers of information, allowing institutions to relate POIs to other data, such as roads. They can be very complex and require hours to produce client-requested maps.
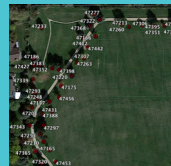
SIMPLE GPS MAPPING

Online tools are often free, can be downloaded for offline use and are extremely easy to use. The quality of the graphics and the functionality is improving constantly.

THE GIS SYSTEM

In the past, "GIS" was the only way to reliably create reproduceable maps that could also accept new data in the future, all on the same set of coordinates. But the systems are rather expensive, and also quite frustrating to use for many people. They require many times the training time. For occasional users, even simple maps can be time consuming to create and difficult to produce professional results

They are still the most capable systems out there today, but the unique capabilities apply to very few trusts – generally those who already have in-house teams of people handling the GIS stuff.

The critical component of GIS is that it stores information in "layers," allowing the superimposition of one set of data upon another. Better still, this data can be used to calculate many things, such as whether or not an object on one part of the map would be in the view of another location on the map.

Municipalities and large institutions often will use GIS because it allows them to put many of the diverse types of geolocation information into one common database. The size of those institutions also allows them to spread the high costs of running such a system across several or many different departments and applications.

There will be projects with the largest of corporate or municipal landowers where they will require land trusts to be GIS-compliant. Until recently, this meant needing to have their own GIS. Today, though, information can be exported from systems like Forest Metrix into open formats that the clients' GIS can read. This recent development eliminates the need to run GIS in many cases.

THE CAD SYSTEM

The other odd sort of mapping data that will appear occasionally with larger landowners is the Computer Aided Design (CAD) format. CAD is essentially a big graphic file that places objects in precise locations relative to one another, but generally not very accurately relative to a particular place on Earth.

Engineers and surveyors like CAD because it provides great precision for building projects, and this is easily represented on those architect-type drawings where the lawn is perfectly green and the trees all look like they came out of the same Lego box.

Engineering firms require such precision in locating the multiple objects that they will be constructing that they rely on surveyors to physically measure things, rather than trust someone taking a reading from a device. Landowners tend to hold the surveyors in great regard, which sometimes is problematic. Surveyors hired for building projects have a long history of not paying very close attention to locations in natural environments. Land trusts will often find the accuracy of non-property-border locations requires some verification.

It may be useful for land trusts to take their own location measurements, not because they'll be more accurate but because it is very difficult to produce interactive maps regarding the points of interest without that data. Unfortunately, CAD data is often incompatible with other common systems, since CAD systems are typically used in a way that does not place objects in an actual physical place. Instead, objects in a CAD file only relate easily to one another.

CAD files, unlike the others, also presume that the Earth is flat, so a client in Seattle, about half-way between the equator and the North Pole would see his lot lines drawn as a square by the CAD user, but it would look more like a keystone shape to the GIS user. These differences refer to the "projection" of the earth underneath the lot.

PROJECTIONS, TRANSLATIONS AND OTHER THINGS THAT GO BUMP IN THE NIGHT

How to Avoid Unneeded Complexity

When a landowner gives you a set of numbers, you may not even know how they were derived, and what cooking you need to do to get them to the correct place on Earth.

GPS DATA

If you stick to GPS data, you're in luck. GPS data is now generally normed to a common projection of Earth. This means that data from one device is interchangeable with that from another. You might find that the numbers are represented differently (expressed in degrees rather than decimals), but this is easily translateable back and forth.

CAD DATA

CAD data often does not match up with another system. Sometimes the State Plane system is used, and those data become translateable - with enough knowledge - back to latitudes and longitudes. Client experience shows that CAD users often do not appreciate the difficulty others will have. The good news: data from a POI database can usually be imported into CAD systems so that it can display collected data.
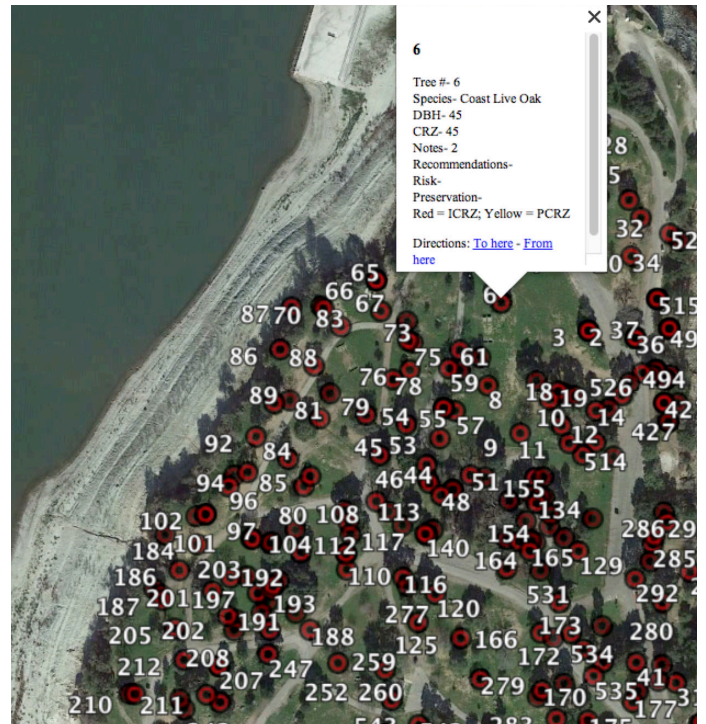
DATA FROM GIS

GIS systems allow the collection of different forms of data, so you never really know what a client will give you from a GIS installation. It might be GPS coordinates translated to the standard NAD83 projection. It might, however, be "northings" and "eastings," Optimally a client with a GIS system would provide to the locations published as GPS points. Having a common projection is important is that any new location data taken in the field will need to match up with the existing POIs in the database.

NORTHINGS & EASTINGS

These are coordinates that need to be located on earth before they become meaningful. Northings and eastings often conform to a regionally-shifting set of rules called the State Plane system. For instance, near Seattle, there are two different systems, depending on the town. The coordinates start at a specific place on the ground and often have some arbitrary numbers added. For example, in Kings County, WA they add an additional 500,000 to one of the numbers. Much local knowledge is required to perform such translations.

THE REALITY OF WORKING WITH MULTIPLE PROPERTIES USING DIFFERENT METHODS

A problem with both CAD and GIS is that the people who use them tend to believe that everyone else either uses those same systems, or at least they should. They tend to discount the idea that other systems are more useful and practical for people with other objectives.

We've worked with several companies that were stuck between the proverbial rock and a hard place, with a partner that uses GIS, an engineering subcontractor that uses CAD, with staff stuck with the task of integrating all of this together into something that an actual human could hold in their hands and understand. This may seem insurmountable, but don't despair; there are ways to thread this needle. Here is how we've seen our clients best manage these data and these relationships:

If the surveyor, engineering firm or landowner uses GIS, ask them for the specific field structure used to store data related to those locations. With a flexible professional database, you can publish an "attribute table" that will provide the POI-specific information that will fold right into their data. Let them know that you can publish to them the coordinates in KML format, which has become the most common open format for passing along mapping data. Another format frequently seen is GPX, a popular stand-alone open file format.

If partners are using CAD data or simple metes and bounds from a survey, ask if that information has been "geolocated." Most people will stare blankly at that question, but it's worth asking because in a significant minority of cases, people use systems that will do this. It will take information from a survey and relate that to specific locations on the ground, which can allow the translation of the CAD data to GIS, or - better still - the sort of simple coordinates that real people use to make maps.

In most cases, surveys will be kept as graphic documents for reference, and future layered data - such as for stewardship - will be kept separately.

Ultimately, all of this effort of collecting data on boundaries and points of

interest is usually useless unless it can be put into the form of a map. Those with GIS probably wish to produce this map themselves, otherwise they wouldn't spend the significant money and time to maintain such a system.

If you are using a self-contained database system like Forest Metrix, you can just click a button to produce a map, even selecting which POIs should be included based on specific criteria, and coloring and labeling them by different factors. When producing maps for clients, Forest Metrix users usually export that data into a KML file and open it up in a favored mapping program, like Google Earth, which is useful for providing base maps, including streets, and other real-world features lining up correctly with the POIs.

Contact us directly to see how mapping can be integrated into your practice.

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THANK YOU FROM

FOREST METRIX

Our Forest Metrix clients have been our eyes and ears for developing new and simpler ways to conduct mapping workflow. We cannot bring these observations - or constantly improving software - to you without the help, encouragement and comaraderie that we find with our clients. Thank you all.