

# ArcPad a new tool for Asset Inventory/Management at Nevada DOT

Eric Warmath  
GIS Program Manager, NDOT



# Topics

- Historical Data Collection Methods
- Current Methodology
- Operator Safety Issues
- Add on Technologies
- Database Design
- Time Savings

# Historical Data Collection Methods

- Trimble hand-held GPS units using data dictionaries in Pathfinder (Spatially accurate with standard attributes)
- The Excel spreadsheet (loosely based on mileposts not very spatially accurate and with considerable variation in attributes) subject to gross error if a road is re-mileposted all or in part.

# Position Position Position !

- GPS Coordinates do not change if you ignore continental drift and the facility is not moved. Attributes remain uniform, searchable, and can be symbolized uniformly in GIS, ArcPad, or web apps.
- Excel spreadsheets based on mile-posting are subject to human errors such as typos and are dependent on mile-posting not changing. Yes, they can be linearly referenced but they may not be very spatially accurate.

# Current Methodology

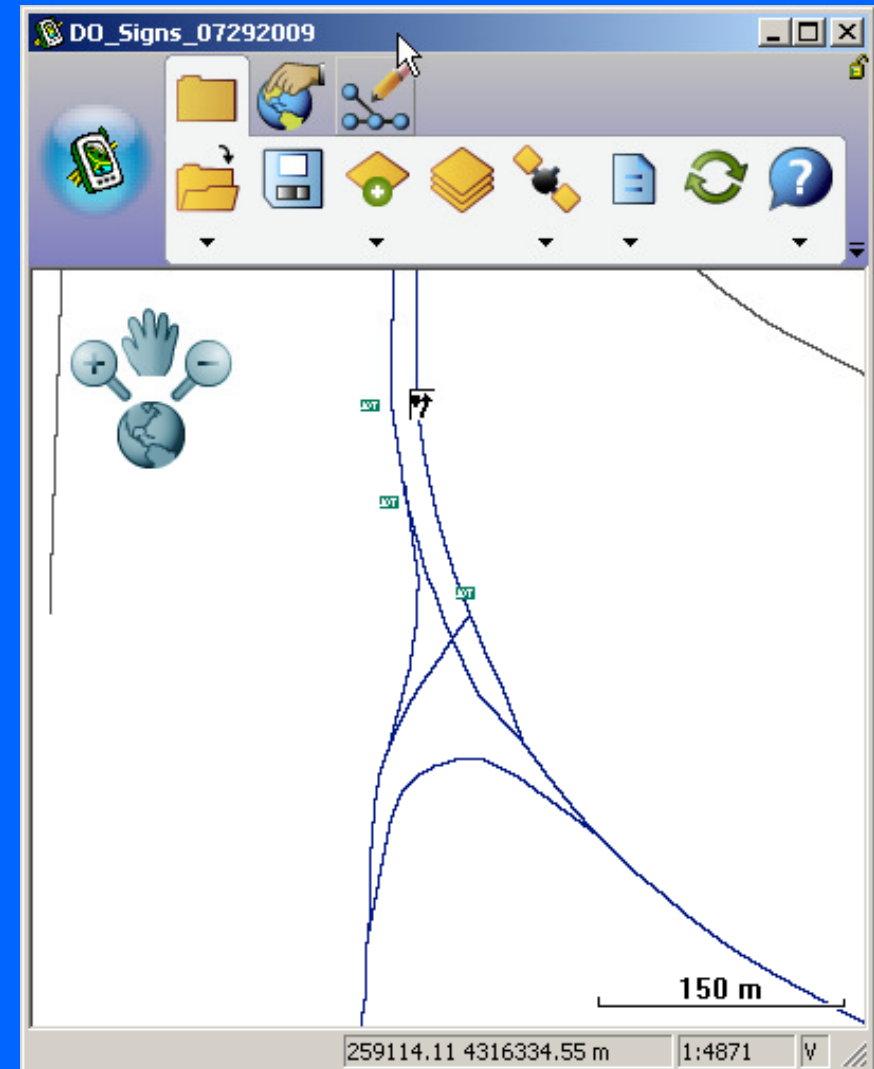
- ArcPad 8.0 for most users now and for all new GPS data collectors.
- Pathfinder Data Dictionaries for some pre-ArcPad users. (funding required to upgrade)
- Hardware is all Trimble Geo XT or XM. This is for positional consistency and ease of training.

# Safety Issues

- Some areas are just not safe to GPS without traffic control such as very narrow median dividers.
- With ArcPad we can digitize a feature or use an offset while working from the shoulder and not have to risk personnel.
- Because ArcPad can also do analytical functions with other datasets and auto populate fields, less time is needed by the data collector to fill out all attributes thus reducing exposure to accident.

# Operator Screen

- This screen shows signs already in the dataset. If a new sign was to be added you would see a GPS curser at your location and you would collect and attribute the new feature.
- If the feature had been moved you would see that it is not in the right place relative to the GPS curser.
- *No curser is visible because the GPS is off but it is usually in the center of the screen.*



# Add on Technologies

- We can use the software either on the handheld or with field laptops. It is very useful in a vehicle setting if you use a field computer. (*good for old eyes too!*)
- We have investigated some of the options of syncing cameras and the GPS unit and found potential time saving there as well. (waiting on a new FY money)
- Laser Range Finders were not found useful because of magnetic compasses. It is impossible in a mobile setting (you need to be 30 feet from the car) and around power lines and other metal objects.



# Database Design

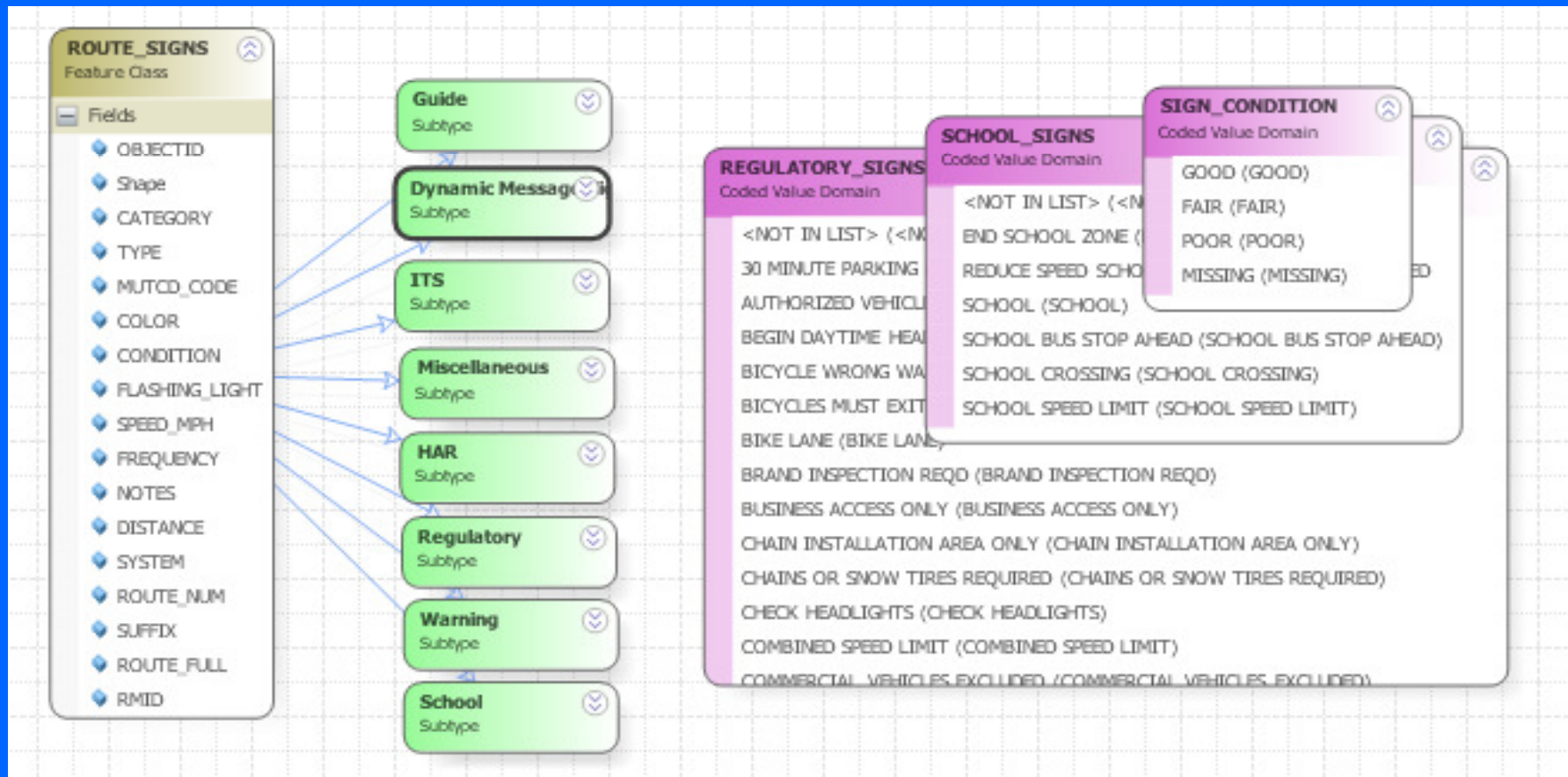
- Good geodatabase design is something all GIS professionals know something about.
- For ArcPad developers it is essential because it allows for rapid creation of forms.
- Attributes can be longer than shapefile limits.
- Domains are converted to drop down lists. It is shared between the geodatabase and Arcpad.
- In Pathfinder you could have different data dictionary fields from the geodatabase creating merging issues back in the office.

# Check out of data

- All the latest data is downloaded each time you go out in the field without having to copy files to the unit (editable and background data).
- This ensures you are going out with the most up to date versions of the file. This is especially important for validation.

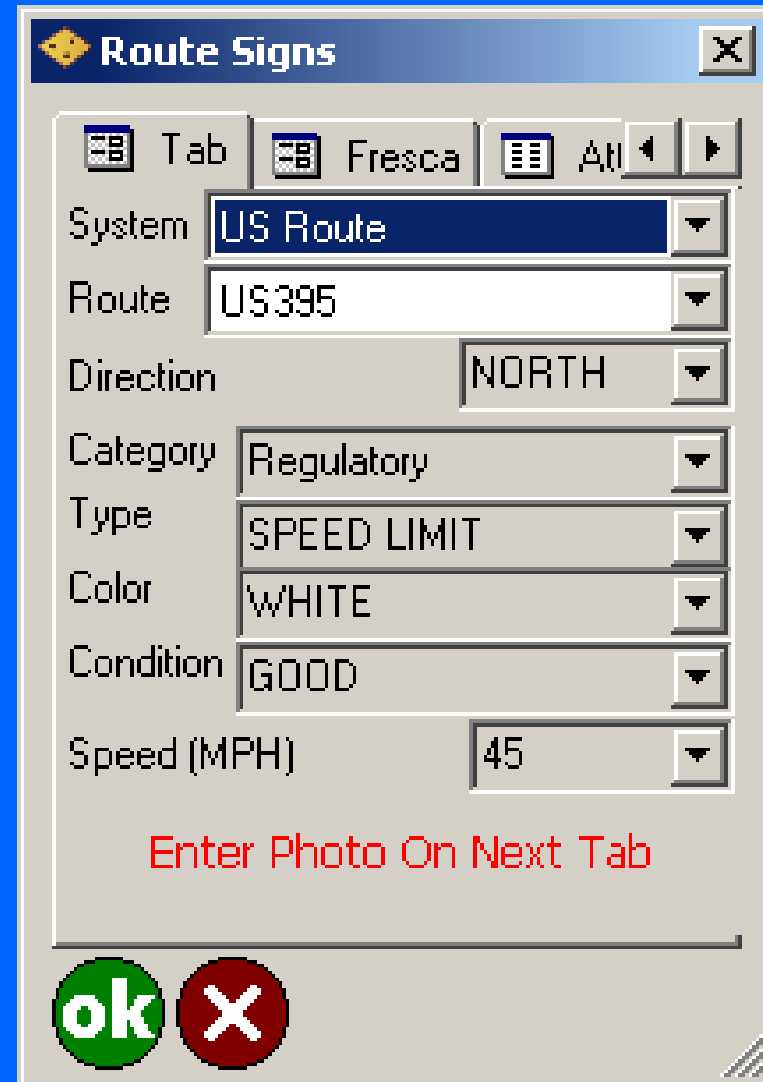
# NDOT Signs Geodatabase

- The Database, attributes, and the domains of each attribute field.
- Subtypes allow you to limit dropdown choices as pre-selection to those that are relevant to the category.



# Our Signs Form

- Forms can have multiple tabs
- Dropdowns are based on the domains



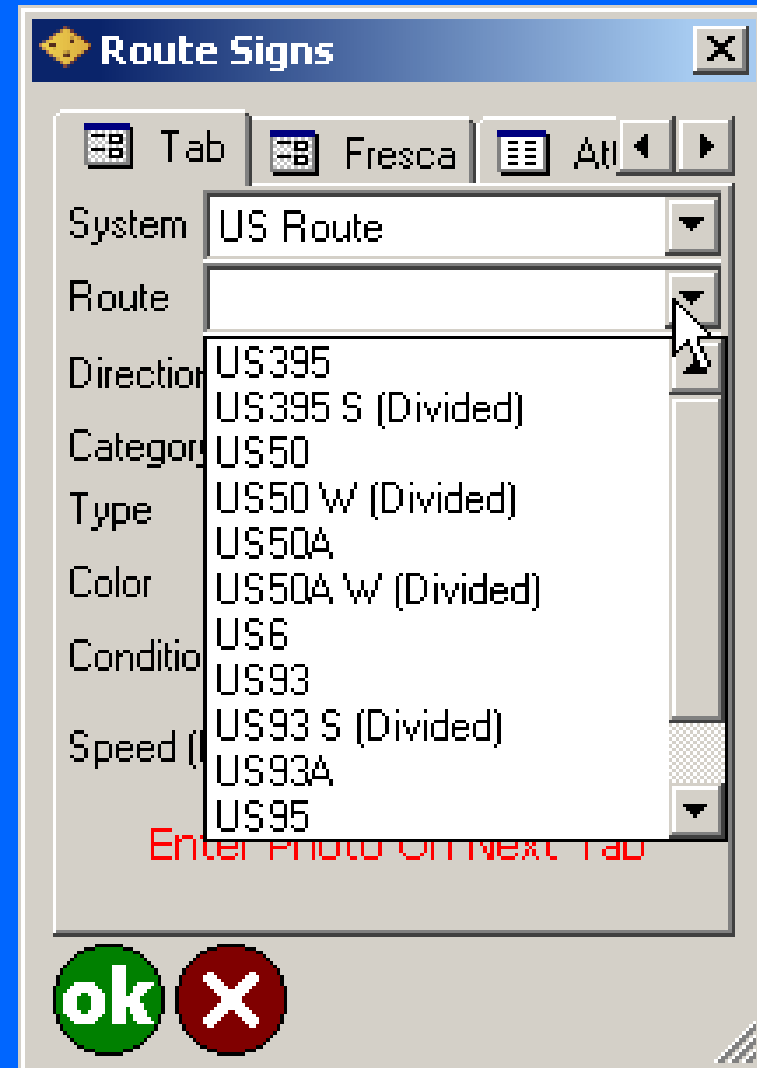
The screenshot shows a window titled "Route Signs" with a close button (X) in the top right corner. The window contains a tabbed interface with three tabs: "Tab", "Fresca", and "Att". The "Tab" tab is currently selected. Below the tabs, there are several dropdown menus and input fields:

- System: US Route
- Route: US395
- Direction: NORTH
- Category: Regulatory
- Type: SPEED LIMIT
- Color: WHITE
- Condition: GOOD
- Speed (MPH): 45

At the bottom of the form, there is a red text prompt: "Enter Photo On Next Tab". Below the form, there are two circular buttons: a green "ok" button and a red "X" button.

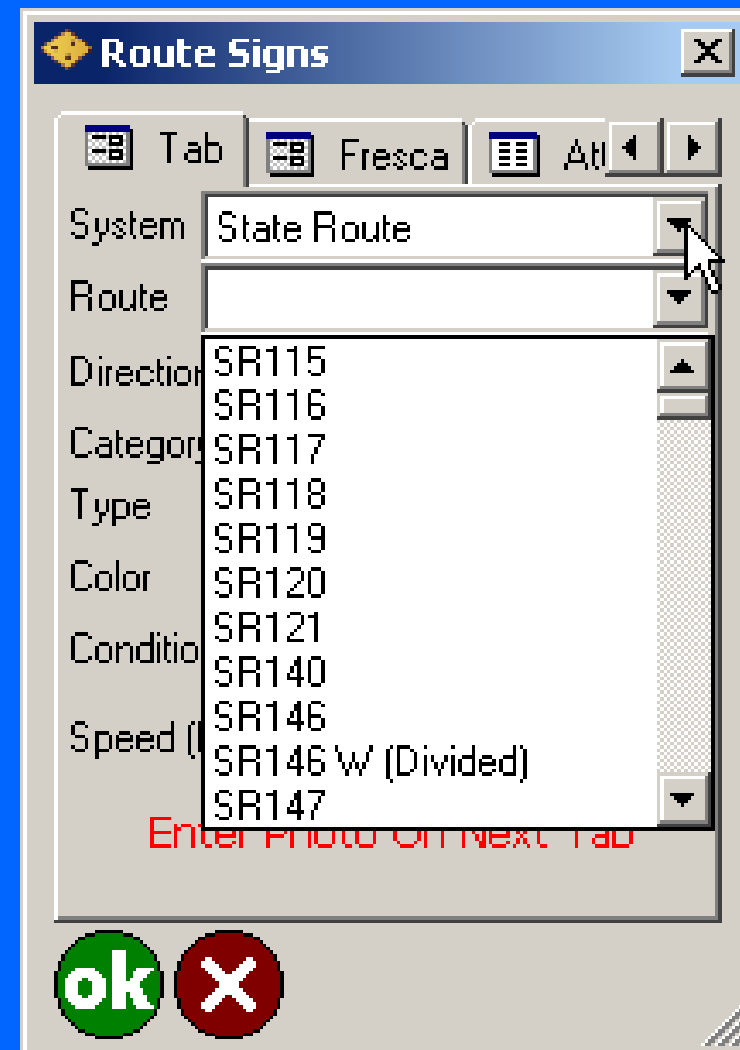
# Dependant Dropdown Tab

- By picking the route type US Route it then changes the dependant dropdown to all valid US Routes only.



# Dependant Dropdown Tab

- By picking the route type State Route it then changes the dependant dropdown to all valid State Routes
- In this instance simple scripting was used instead of domains because there is only one subtype field and it was in use already.



# Check-in

- Extremely quick to upload.
- Only one file is copied.
- It only takes seconds to check the data back into the database.
- You are working thru ArcMap so you have the ability to do QC on the new data immediately.
- You can use versioning tools to see the new data and QC it before posting it back to the master data set.

# Workflow Time Savings

- Example: the GPS unit knows where you are and via GIS operations can fill in district, county, or other attributes saving time.
- The data checked in/out can be uploaded in a matter of minutes via one program.
- Before to bring data back into the geodatabase you had to open pathfinder, export a shapefile then merge the data in ArcGIS. No shapefile attribute length issues come into play.



# Other Department Options

- NDOT is also looking at incorporating Mandli's Roadview 7 tool to collect data in the future.
- NDOT is starting to require GPS deliverables as part of contract work. ArcPad can be used to spot check the accuracy of the deliverables in the field before final payment is made.
- ArcPad will still play an active part in collection and validation between Roadview cycles. (2-3 years)

# ArcPad Pros

- Ease of use / Easier to train
- Easily customizable (no contractors, no waiting for the IT department)
- Time Savings (offsets our monthly furloughs via increased productivity)
- Well integrated with our department GIS
- Helping to expand users of GPS/GIS to get better data across the department
- Can calculate and populate fields in different units of measure or coordinate systems on the fly. (Our standard coordinate are UTM easting/northing but we add lat/long values and convert metric heights to feet)

# ArcPad Cons

- Initial cost appears to add to the price of the total package of getting hardware/software. (but you don't need full pathfinder any more so it is slightly less expensive in total)
- There is currently a bug that prevents us from using it to collect very long road segments over 16 miles. (*there are some long unbroken roads in Nevada*)
- You can only fill in attributes after collecting a feature. But that can be somewhat offset by the repeat feature function.

# Conclusion

- We continue to develop end user specific applications for a variety of customers from Archeology to Hydrology.
- We are willing to share code with other agencies.
- It is a low cost tool for asset management that quickly pays for itself no matter what type of asset you are talking about.

Contact Info: [ewarmath@dot.state.nv.us](mailto:ewarmath@dot.state.nv.us)