

A Growing GIS for a Growing City

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Abstract

Las Cruces, NM is currently the 11th fastest-growing city in the nation. In 2006, the city saw four annexations and the addition of 43 major subdivisions. The City GIS basemapper uses COGO within ArcEditor to maintain the parcel database as new plats are released. This parcel basemap serves as a foundation for all the City's data layers. It is used to create street centerlines and address points in the correct spatial locations and is directly implemented in the creation of features in many other data layers such as Right-of-Way, Subdivisions, and Zoning. Use of the Parcel database and topology rules allows many datasets to be updated quickly and accurately. These layers can then be used together to create a visually appealing map of spatially-coincident features.

A Rapidly Expanding City

Las Cruces, the second largest city in its state, is located in southern New Mexico's Dona Ana County, which is the most rapidly-growing county in New Mexico. It is the 11th fastest-growing city in the nation, and contains about 35,000 parcels of land. In the past two decades, the City of Las Cruces has annexed 15,000 acres, increasing the city limits from 21,095 acres to 36,095 acres. Currently, the City has five additional annexations on the table, totalling 13,030 acres. This rapid pattern of growth necessitates an advanced and efficient system of parcel and land use data management.

Background

Prior to the availability of drafting software, all City of Las Cruces maps were hand-drafted. In 1992, the City began drafting spatially, using AutoCAD with Geo/SQL to create and maintain parcel data. By the late 90s, City staff were creating and maintaining data and maps for Zoning and other layers, using AutoCAD, Arc/Info Workstation and ArcView. All of the new data layers were originally created using the Parcels basemap, but multiple staff began to update the different layers, which eventually led to significant boundary conflicts between the data layers. The conversion to ArcGIS software has made it possible to develop a method of maintaining many layers quickly, in a single-user environment. Additionally, the data layers are spatially coincident with one another and topologically clean, which provides an attractive, easy-to-read map.



An image of a hand-drafted City map.

The Update Process

The City's Parcel basemap is the foundation of the development and maintenance of data in many layers, which include zoning, annexations, city limits, subdivisions, right-of-way, easements, city streets, and point addressing. All layers maintained by the basemapper, including Parcels, are contained within a single geodatabase so that all layers can be accessed for editing at once, rather than the user having to switch back and forth between edit sessions. Also, whenever possible, the other layers should have fields whose name and type are identical to fields in Parcels so that tabular data automatically updates across the layers when data are copied and pasted.

Construction Lines

Whenever the City receives a new subdivision plat, parcel boundaries are drawn in a parcels construction lines layer using the coordinate geometry (COGO) feature in ArcMap. Next, the user draws a box around the construction lines to select them and uses the Scale and Rotate tools to make the new subdivision's outer boundary lines spatially coincident with those of the adjacent parcels. These construction lines are used to generate new parcels, which are then used in the updating of the other data layers.

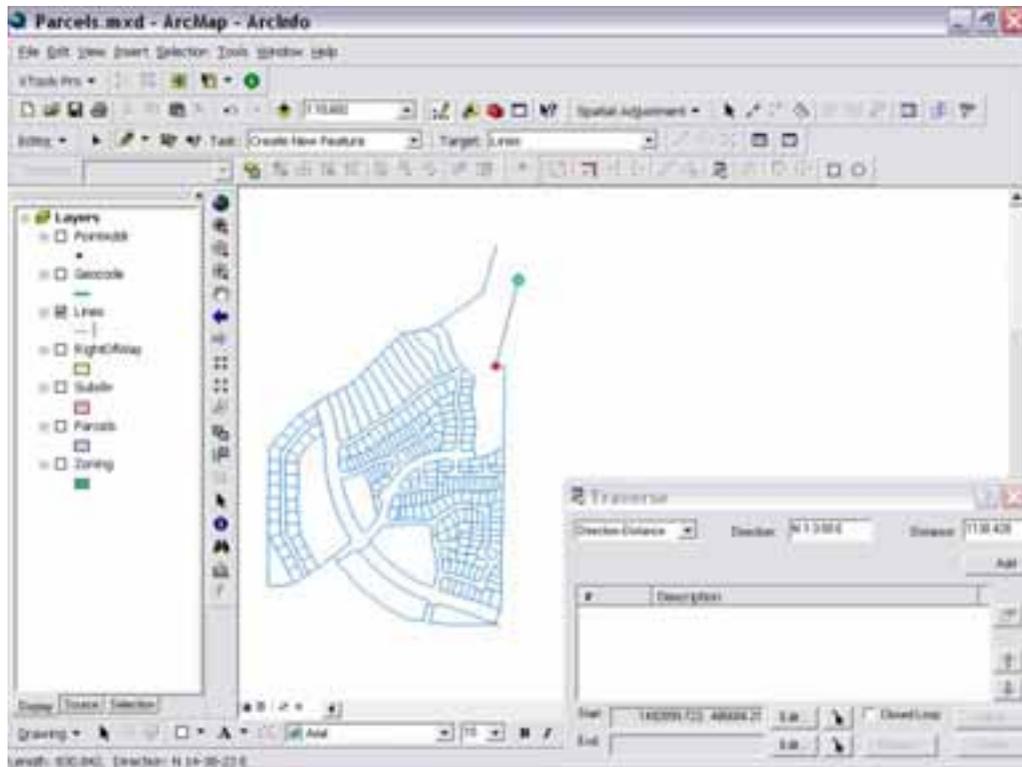


Image of COGO linework for the subdivision being completed.

Parcels

Parcels is set as the target layer, the new construction lines are selected and the Construct Features tool is used in order to generate the new parcels. A non-parcel right-of-way polygon will be generated in the process. A topology check is run on the parcels and then the basemapper updates the feature attribute table with information about the subdivision, such as its name and the edit date.

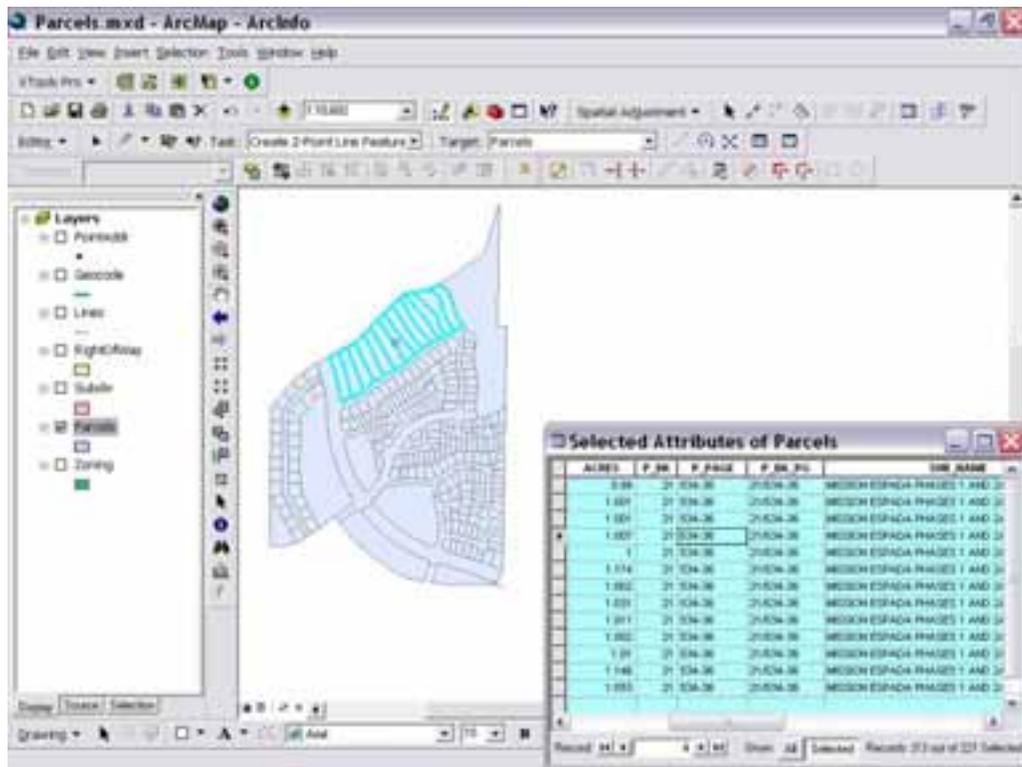


Image of parcels that were generated from the COGO linework and their associated attribute table, which has been populated with subdivision name, acreage of each parcel and information about the plat.

Subdivisions

The next step in this process is to select all of the parcels, including the right-of-way polygon, and perform a Copy/Paste into the subdivision database. All the polygons are then merged for a solid subdivision outline with the fields the database has in common with Parcels automatically populated.

One disadvantage to this approach is that occasionally, depending on the complexity and number of parcel polygons, ArcMap becomes “confused” and cannot complete the merge operation. Validating the topology for Subdivisions sometimes solves this problem. When it does not, other workarounds can be employed. One of them is to draw a box around the construction lines to select them, then draw a smaller box inside the subdivision to deselect the interior lines. Construct Features can then be used to generate the subdivision polygon. At this point, the user can copy and paste a single parcel into Subdivisions and perform a merge so that the attribute data from Parcels carries over.

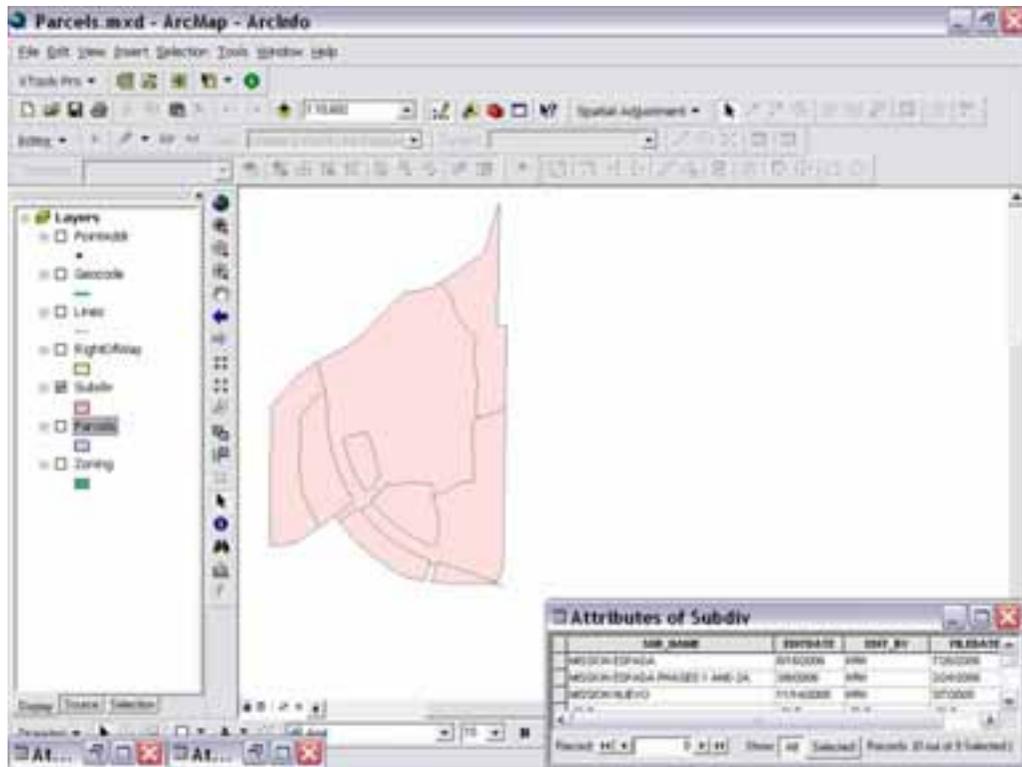


Image of polygon transferred from Parcels to Subdivision database using Copy, Paste and Merge. The table shows the common fields that were populated automatically in Subdivision during this process.

Right-of-way

To update the right-of-way layer, the user simply has to make it the target layer, then cut and paste the street polygon from Parcels into Right-of-Way. The attribute data was populated along with the parcel polygons, so these data will carry over in the Cut/Paste.

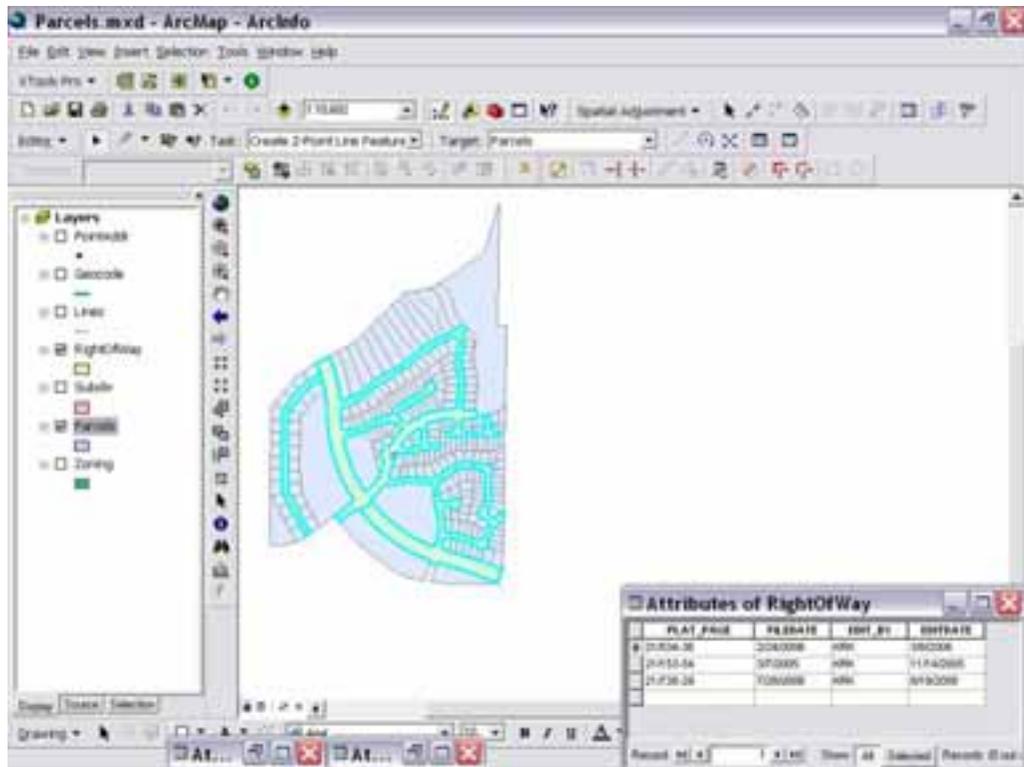


Image of polygon transferred from Parcels to Right-of-Way database in a Cut and Paste. The table shows the common fields that were populated automatically in Right-of-Way during this process.

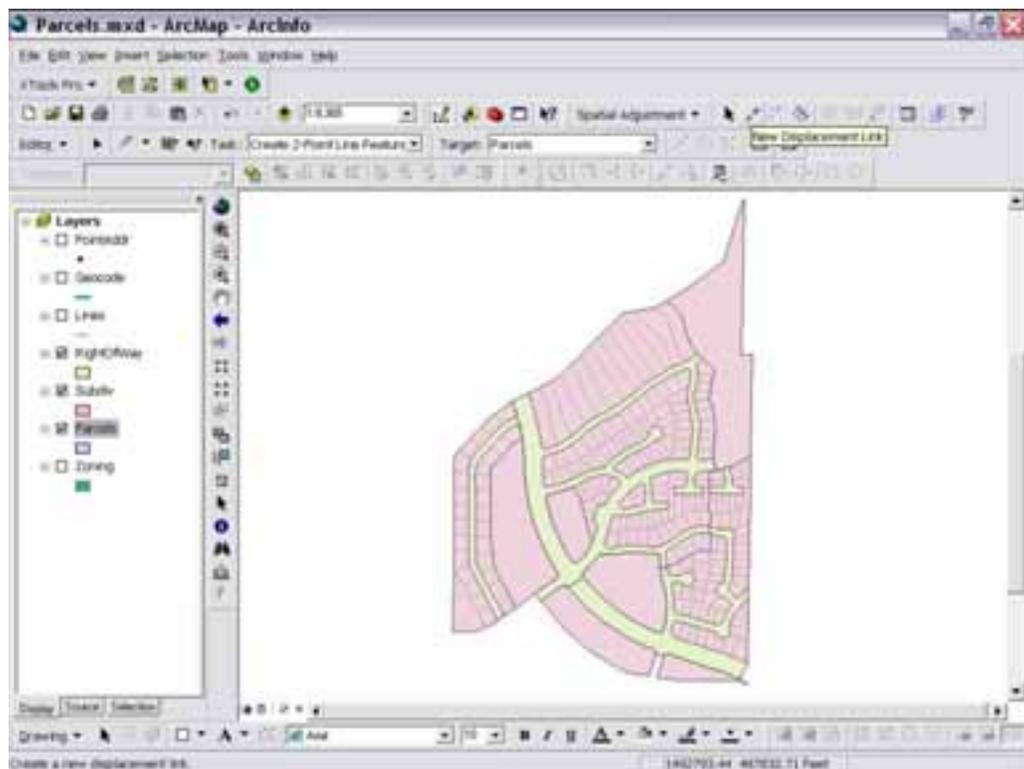
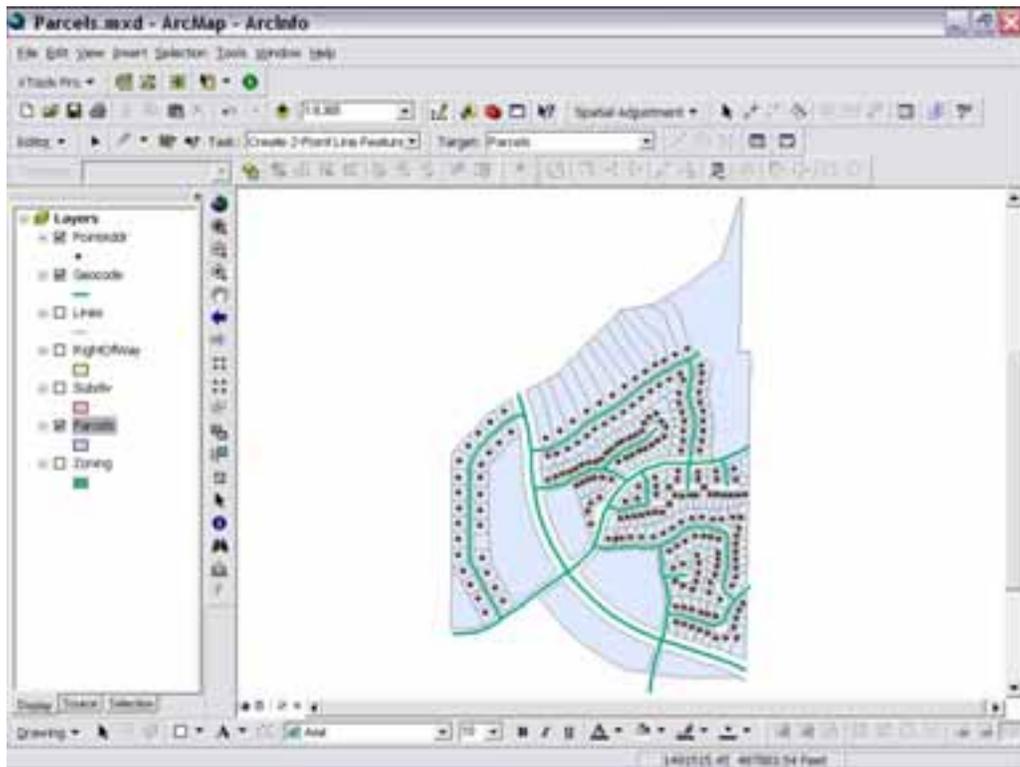


Image of subdivision and right-of-way polygons overlaid with parcels.

Street centerlines (geocoded) and point address

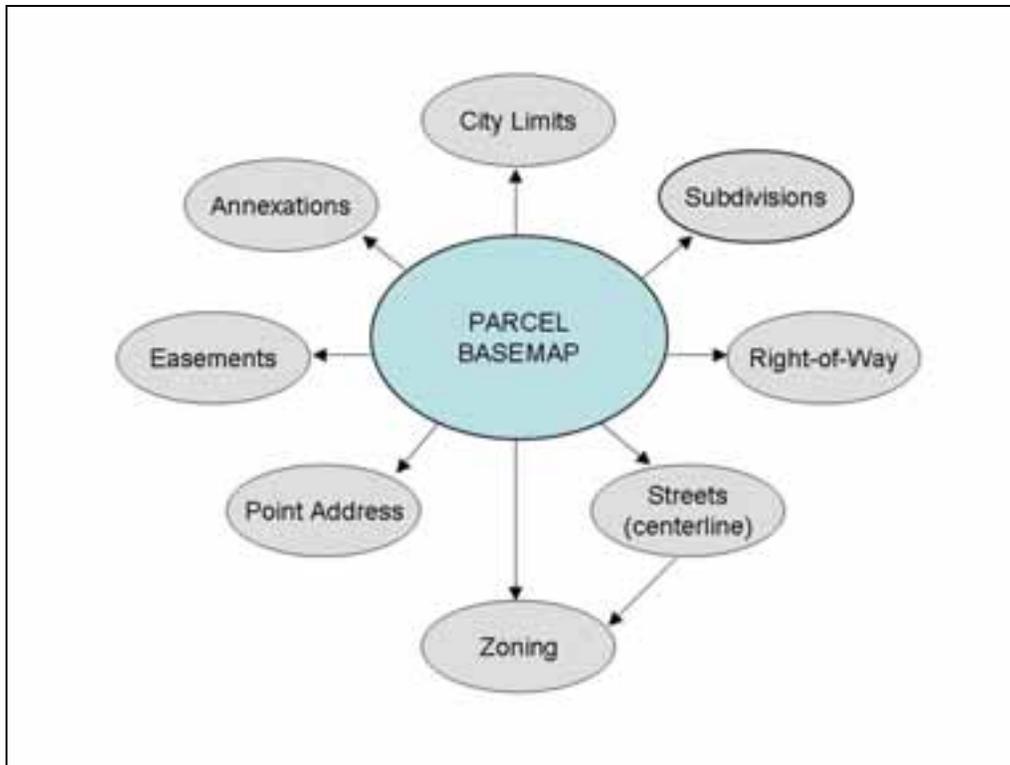
In addition to maintaining street right-of-way data, the City of Las Cruces maintains a geocoded street centerline layer, which is also updated from the Parcels layer. After a subdivision has been completed, the person maintaining the street data is able to use the parcel data with the midpoint tool to draw the new streets. The point address layer is also updated based on the spatial location of the newly-created parcels, though the tabular data will be obtained from a separate addressing plat.



An image of the Parcels database with point addresses and geocoded streets.

Zoning

The City of Las Cruces also uses the Parcels basemap in the maintenance of zoning data, especially when legal descriptions of new zones are unavailable. When the zoning ordinances do not provide coordinates, it is necessary to use the parcel boundaries along with street centerlines in the creation of the new zone boundaries. However, in cases where zone changes do not follow existing parcel lines, the update cannot be made.



The relationship between data layers maintained by City of Las Cruces.

Conclusion

ArcGIS makes it possible to simplify the task of managing and updating several layers simultaneously, which is a good strategy in a single-user editing environment. Simplification and automation of update processes is vital when a high volume of data are being processed, as is the case with cities which enjoy the rapid growth that Las Cruces is currently experiencing. The updating methods the City employs result in sharp, visually-appealing maps with spatially-coincident boundaries and, at the same time, minimizes the amount of time and effort spent updating multiple layers.

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