

# Using ArcGIS Server and the Data Interoperability Extension to Integrate Data from Internal and External Sources

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# Project Background

- The Office of Surface Mining (OSM) regulates surface coalmines in the US
- Most permitting is done by states in cooperation with OSM
- Most mine permit information resides in states
- No central repository of coalmine permit information
- Need exists for centralized geodatabase of permit boundaries and other coalmine information
- OSM, Virginia and West Virginia created a prototype centralized geodatabase using ESRI tools.



# Prototype Goals

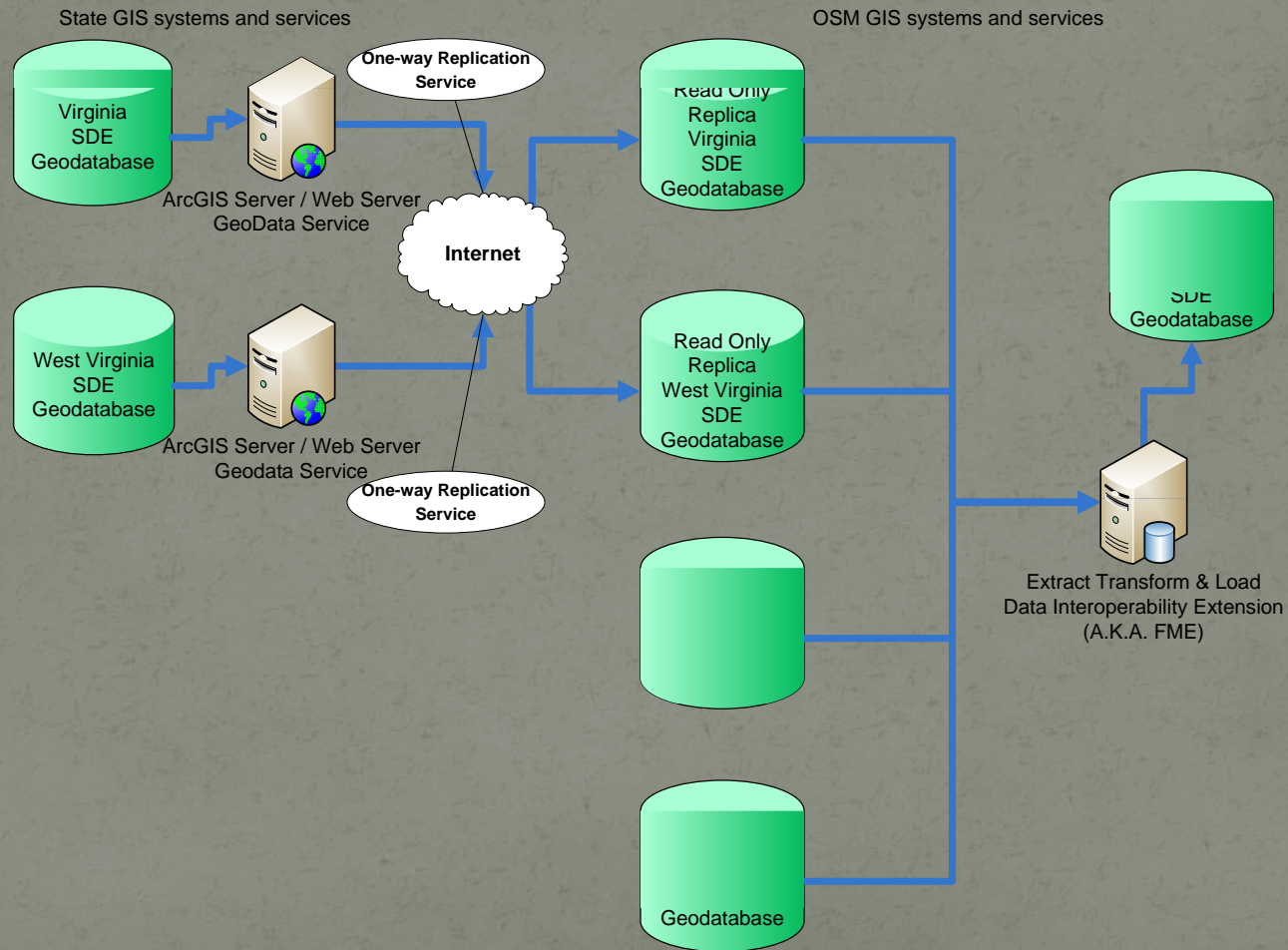
- Replicate relevant feature classes from external sources to geodatabases at OSM's Denver office
- Select pertinent attributes and transform them to a common standard
- Re-project data to a common geographic system
- Merge replicated and OSM internal feature classes into a single feature class



# Prototype Methodology

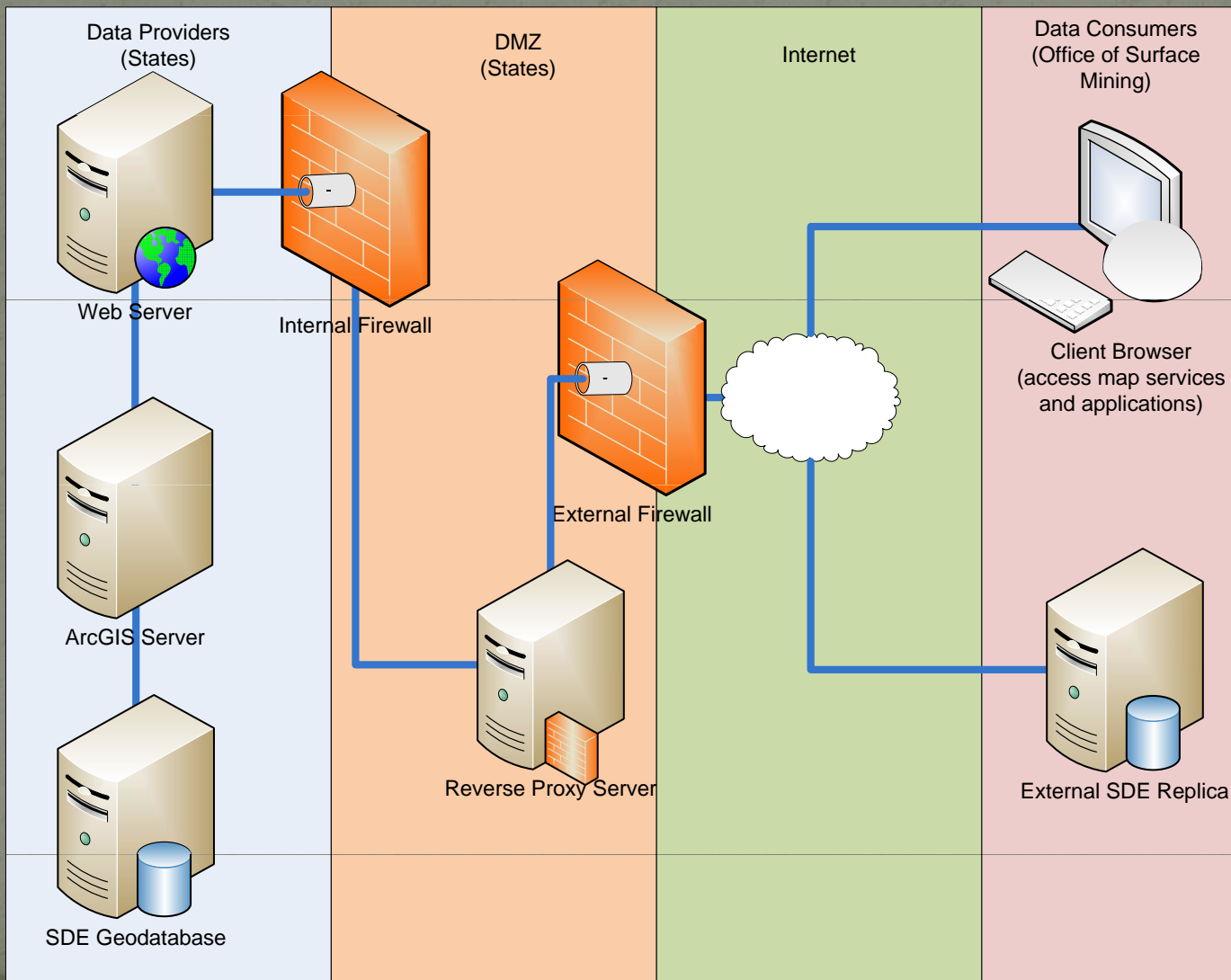
- Virginia and West Virginia published SDE 9.2 feature classes with relevant permit boundary information using ArcGIS Server 9.2
  - Published “geodata services” which allow geodatabase replication
- OSM created one-way replicas of the published features on an SDE 9.2 server in their Denver office
- OSM created an extract, transform and load (ETL) tool using the “Data Interoperability Extension”, a.k.a. Safe Software Feature Manipulation Engine (FME)
  - Tool ingests state replicas and several OSM internal feature classes and outputs a single feature class

# Prototype Configuration

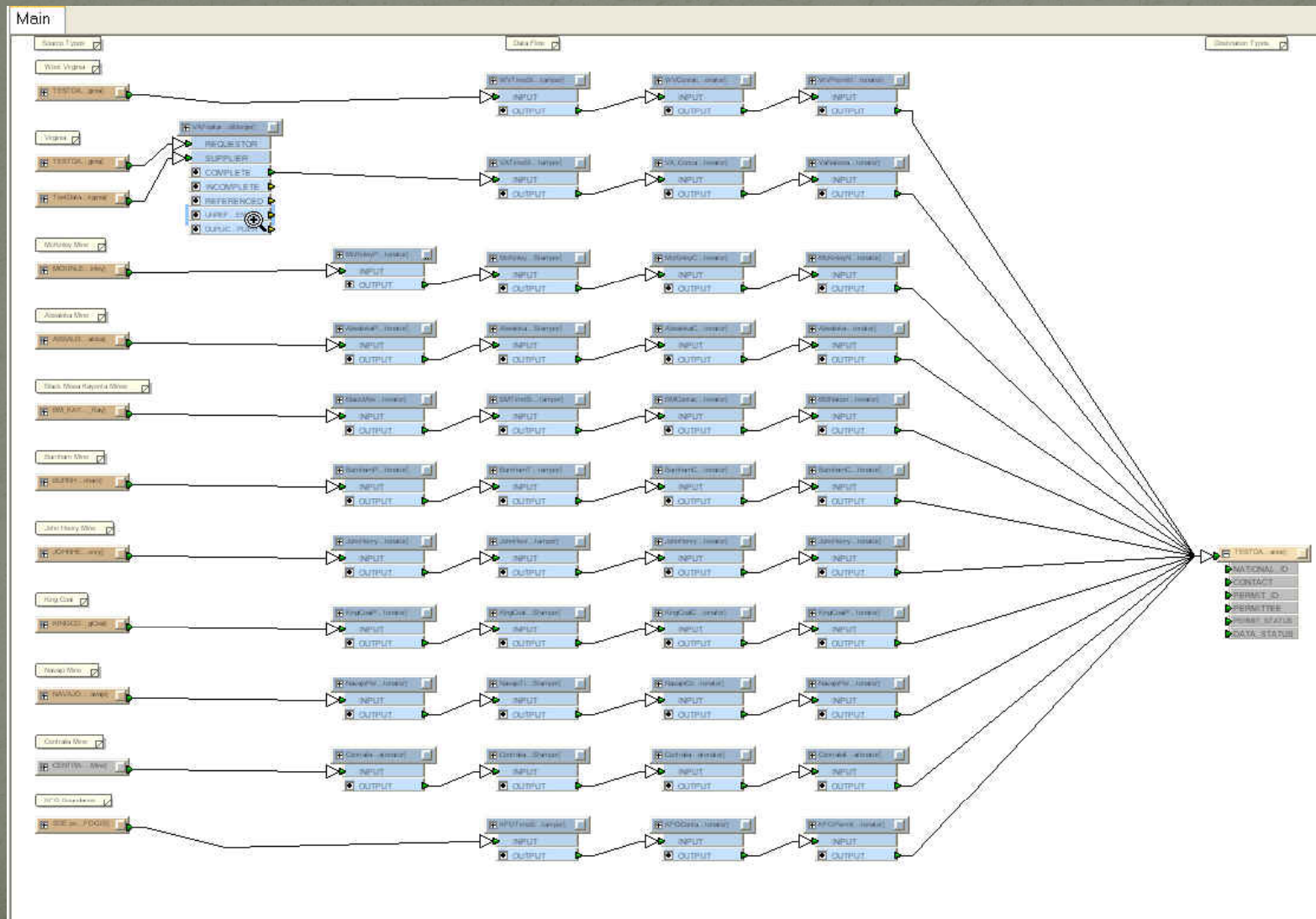




# ArcGIS Server Security Considerations



# ETL Tool Designed for Prototype









# Merging Virginia's Permit Polygon Data with Related Attribute Table

The screenshot displays the ArcGIS Desktop interface with a FeatureMerger transformer configured to merge data. The main workspace shows a diagram with three input data sources on the left: 'Virginia' (a yellow polygon), 'TESTDA...ginia]' (a brown rectangle), and 'TestData...irginia]' (a brown rectangle). These inputs are connected to a 'VAFeatur...eMerger]' transformer box. The transformer's output is a list of fields: 'REQUESTOR', 'SUPPLIER', 'COMPLETE', 'geodb\_oid', 'OBJECTID', 'Permit', 'SHAPE.area', 'SHAPE.len', 'PeNo', 'CoCode', 'TbIPsCode', 'PePsDate', and 'PeSitePhone'. A dialog box titled 'Edit FeatureMerger Parameters' is open, showing the following settings:

- Transformer Name: VAFeatureMerger
- Group By: (empty)
- Merge Type: Attributes Only
- Requestor Join Attribute: Permit
- Supplier Join Attribute: PeNo
- List Name (Optional): (empty)
- Build Incomplete Requestors: No
- Process Duplicate Suppliers: No

The status bar at the bottom indicates 'Ready' and 'VAFeatureMerger [FeatureMerger]'.

# Generating Time Stamp

The screenshot displays the Microsoft SQL Server Data Transformation Services (DTS) interface. The main window shows a Data Flow Task with the following components:

- Source:** A Data Source View (DSV) containing a table with columns: `_timestamp`, `geodb_oid`, `OBJECTID`, `Permit`, `SHAPE.area`, `SHAPE.len`, `PeNo`, `CoCode`, `TbIPsCode`, `PePsDate`, and `PeSitePhone`.
- Transformer:** A `VATimeStamp` transformer (TimeStamper) is connected to the source. Its output is connected to a destination.
- Destination:** A Data Destination View (DDV) containing a table with columns: `_timestamp`, `geodb_oid`, `OBJECTID`, `Permit`, `SHAPE.area`, `SHAPE.len`, `PeNo`, `CoCode`, `TbIPsCode`, `PePsDate`, and `PeSitePhone`.

An `Edit TimeStamper Parameters` dialog box is open, showing the following configuration:

- Transformer Name: `VATimeStamp`
- Time Stamp Format: `^Y^m^d^H^M^S`
- Time Stamp Attribute: `_timestamp`

The status bar at the bottom indicates the current task is `VATimeStamp [TimeStamper]`.



# Generating "Contact" Information

The screenshot displays a data transformation tool window titled "LoadDataToNationalBoundaries". The main workspace shows a flow diagram with several transformer components: "VA\_Conca...tenator]", "VaNationa...tenator]", and "Absaloka...tenator]". Each component has an "INPUT" and an "OUTPUT" port. The "VA\_Conca...tenator]" component is currently selected, and its "OUTPUT" port is connected to a list of attributes. The "Concatenator Settings" dialog box is open, showing the configuration for the selected transformer.

**Concatenator Settings**

Parameters:

- Transformer name: VA\_Concat
- Destination attribute: \_Contact

Attributes:

- \_timestamp
- CoAmIcode
- CoCode
- CoPoolCode
- geodb\_oid
- OBJECTID
- PeAcidFrequency
- PeAcidMonitor
- PeAcidOb
- PeAcidPlan
- PeAltSpecs
- PeAnnvAny

Concatenated Items:

- "Daniel Kestner, Big Stone Gap, Vi

Constants:

Buttons: Add, Replace, Add, Up, Down, Remove, Help, OK, Cancel

The attribute list for the selected transformer includes: \_Contact, \_timestamp, geodb\_oid, OBJECTID, Permit, SHAPE.area, SHAPE.len, PeNo, CoCode, TbIPsCode, PePsDate, and D... ..

# Generating Unique National ID Attribute

The screenshot displays a data transformation workflow in a software application titled "LoadDataToNationalBoundaries". The main workspace shows a sequence of components: an "INPUT" component, followed by a "Concatenator" component (partially visible as "VaNationa...tenator"], and an "OUTPUT" component. Below the "OUTPUT" component, a list of attributes is shown, including "\_Contact", "\_NationalID", "\_timestamp", "geodb\_oid", "OBJECTID", "Permit", "SHAPE.area", "SHAPE.len", "PeNo", "CoCode", and "TbIPsCode".

A "Concatenator Settings" dialog box is open, showing the configuration for the "VaNationalConcat" transformer. The "Parameters" section includes "Transformer name: VaNationalConcat" and "Destination attribute: \_NationalID". The "Attributes" list on the left includes "\_Contact", "\_timestamp", "CoAmlCode", "CoCode", "CoPoolCode", "geodb\_oid", "OBJECTID", "PeAcidFrequency", "PeAcidMonitor", "PeAcidOb", "PeAcidPlan", and "PeAltSpace". The "Concatenated Items" list on the right includes "VA" and "PeNo". The "Constants" section is empty. The dialog box has "OK" and "Cancel" buttons at the bottom right.

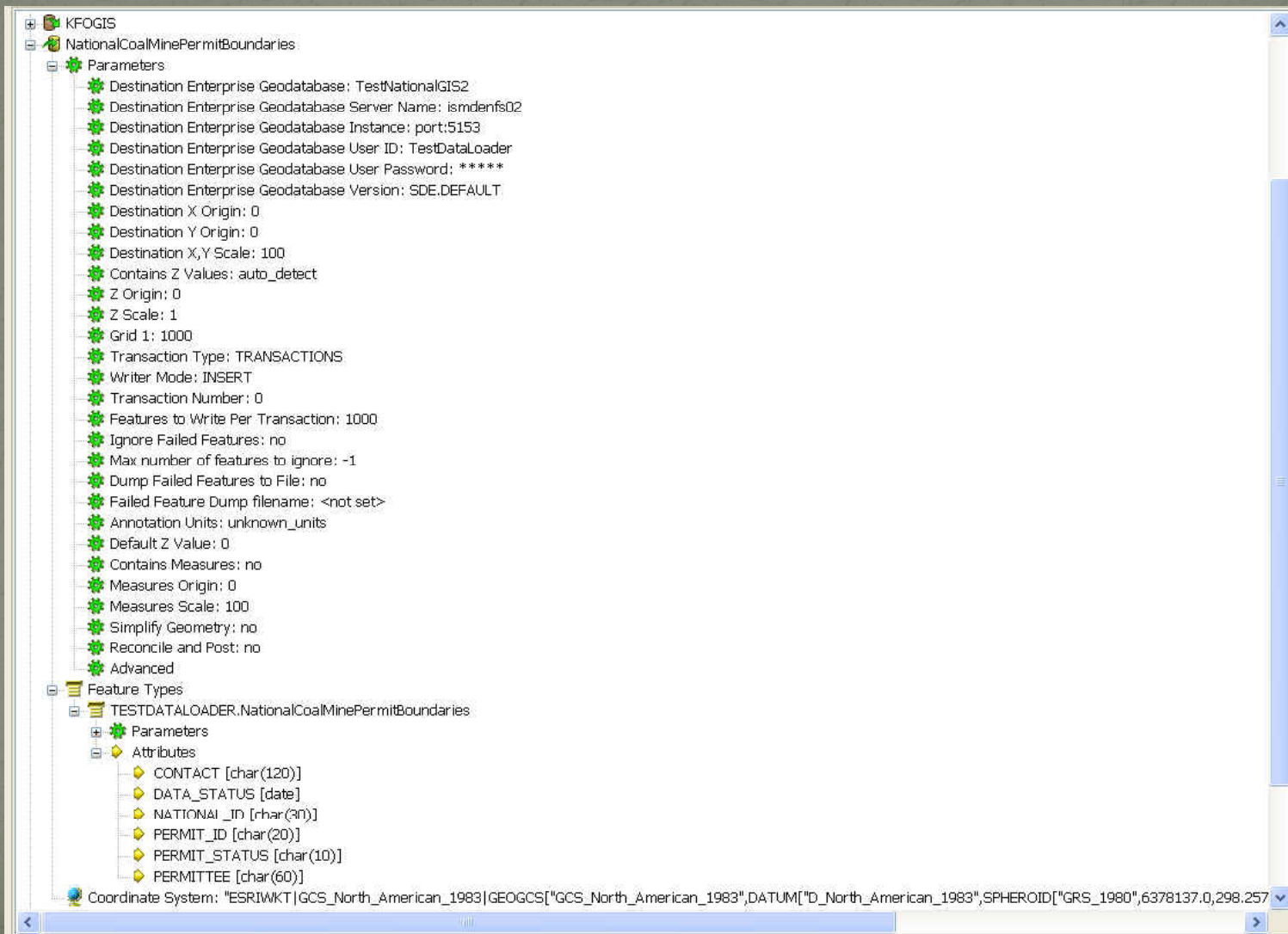


# Merging Virginia's Data into Single National Feature Class

The screenshot shows the ArcGIS Desktop interface with a workflow in progress. The main window, titled 'LoadDataToNationalBoundaries', displays a 'Main' pane with a workflow. Two input feature classes, 'VA\_Conca...tenator' and 'VaNationa...tenator', are being merged into a single output feature class, 'TESTDA...aries'. The 'Feature Type Properties' dialog box is open, showing the attribute list for the output feature class.

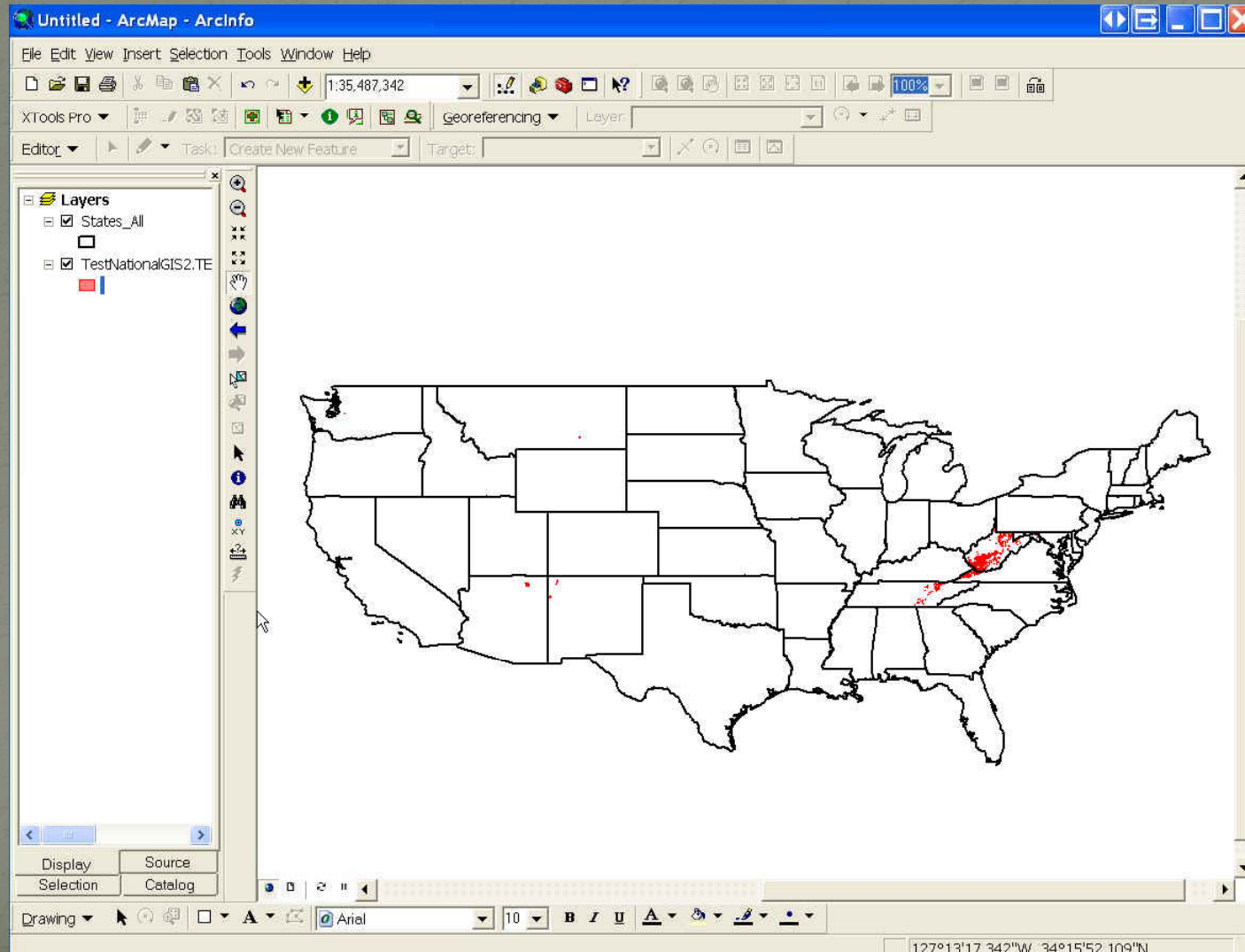
Attribute Name	Data Type	Width	Dec.
NATIONAL_ID	char	30	
CONTACT	char	120	
PERMIT_ID	char	20	
PERMITTEE	char	60	
PERMIT_STATUS	char	10	
DATA_STATUS	date		

# Setting the National Feature Class' Attributes and Coordinate System

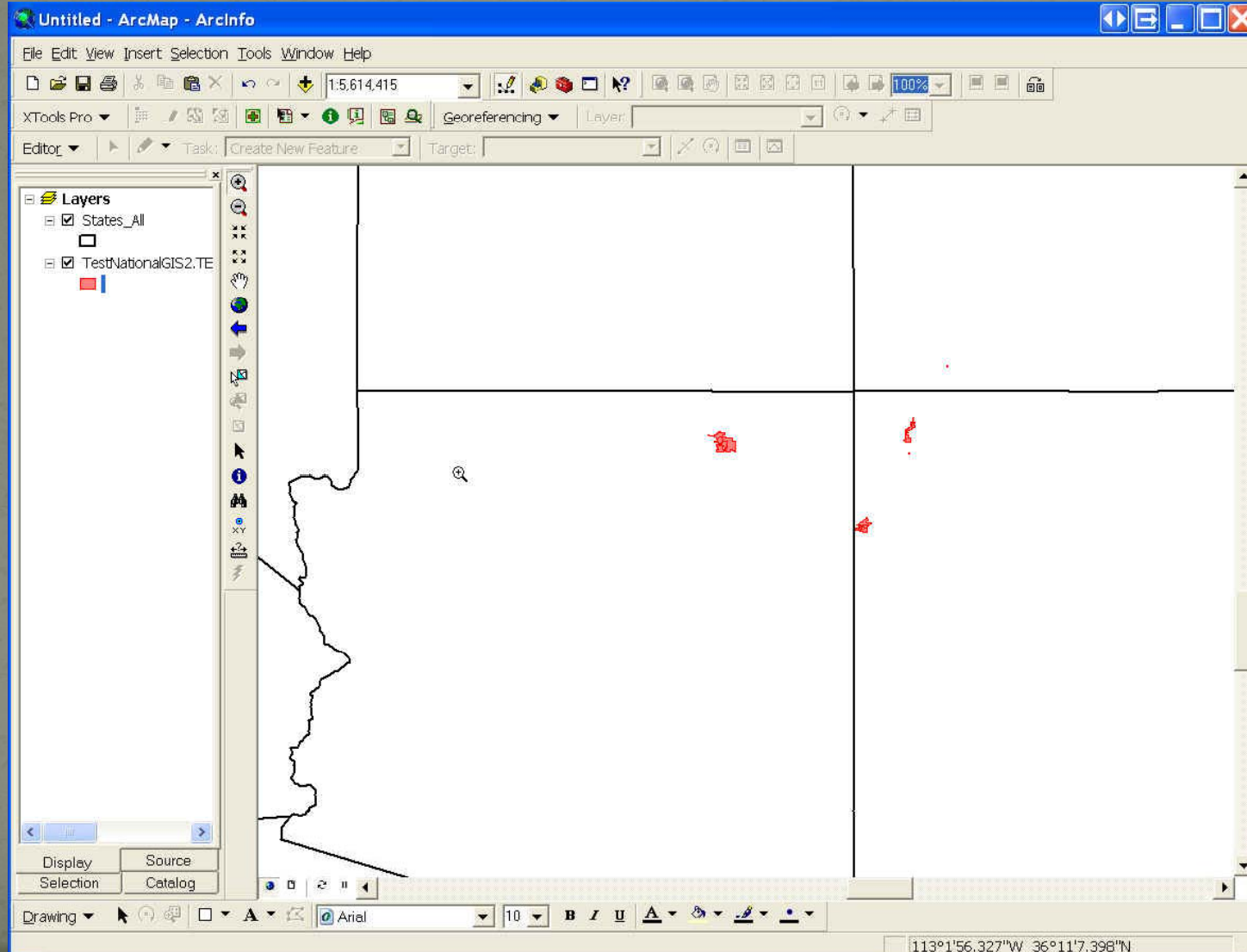




# National Feature Class – National View

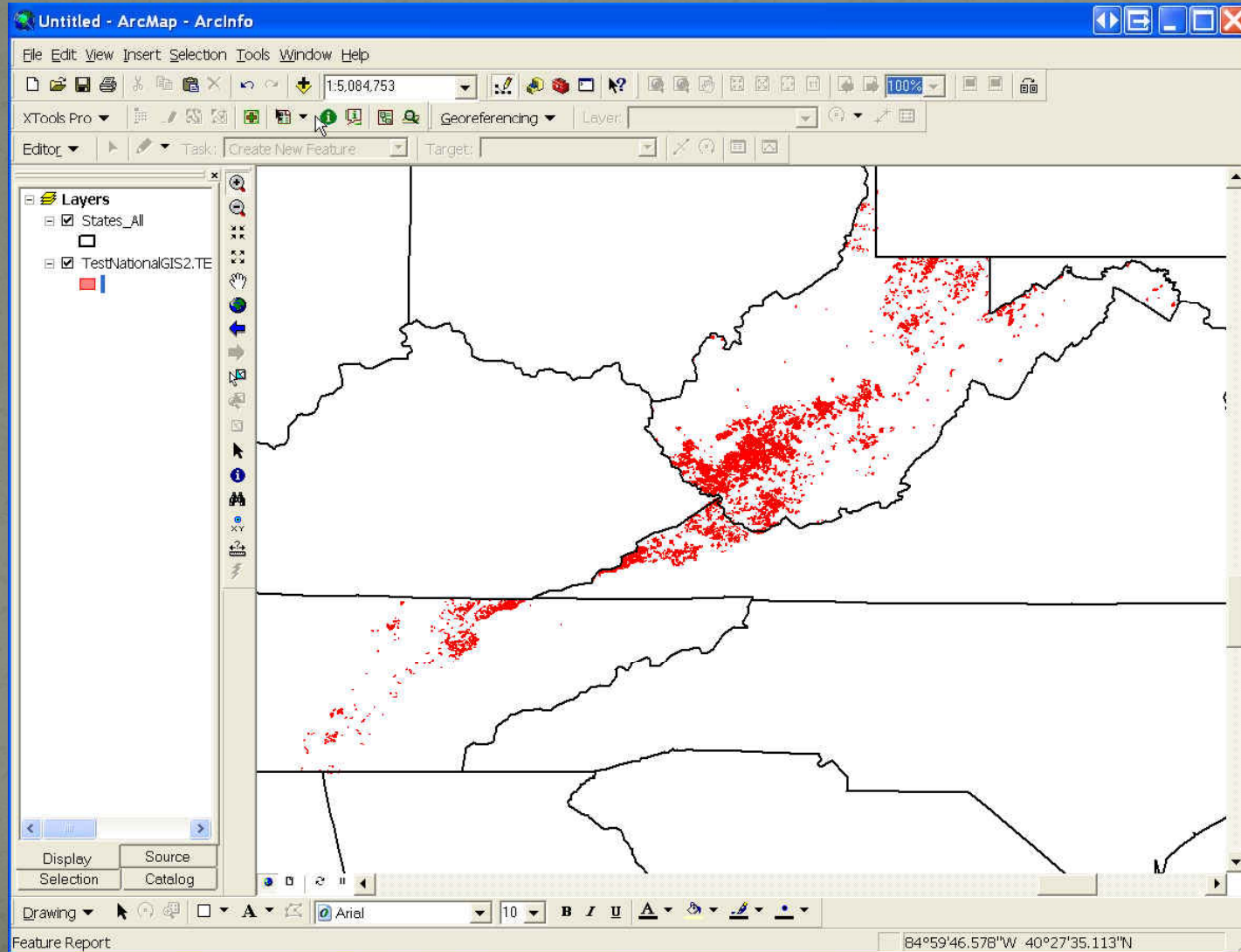


# National Feature Class – Western View

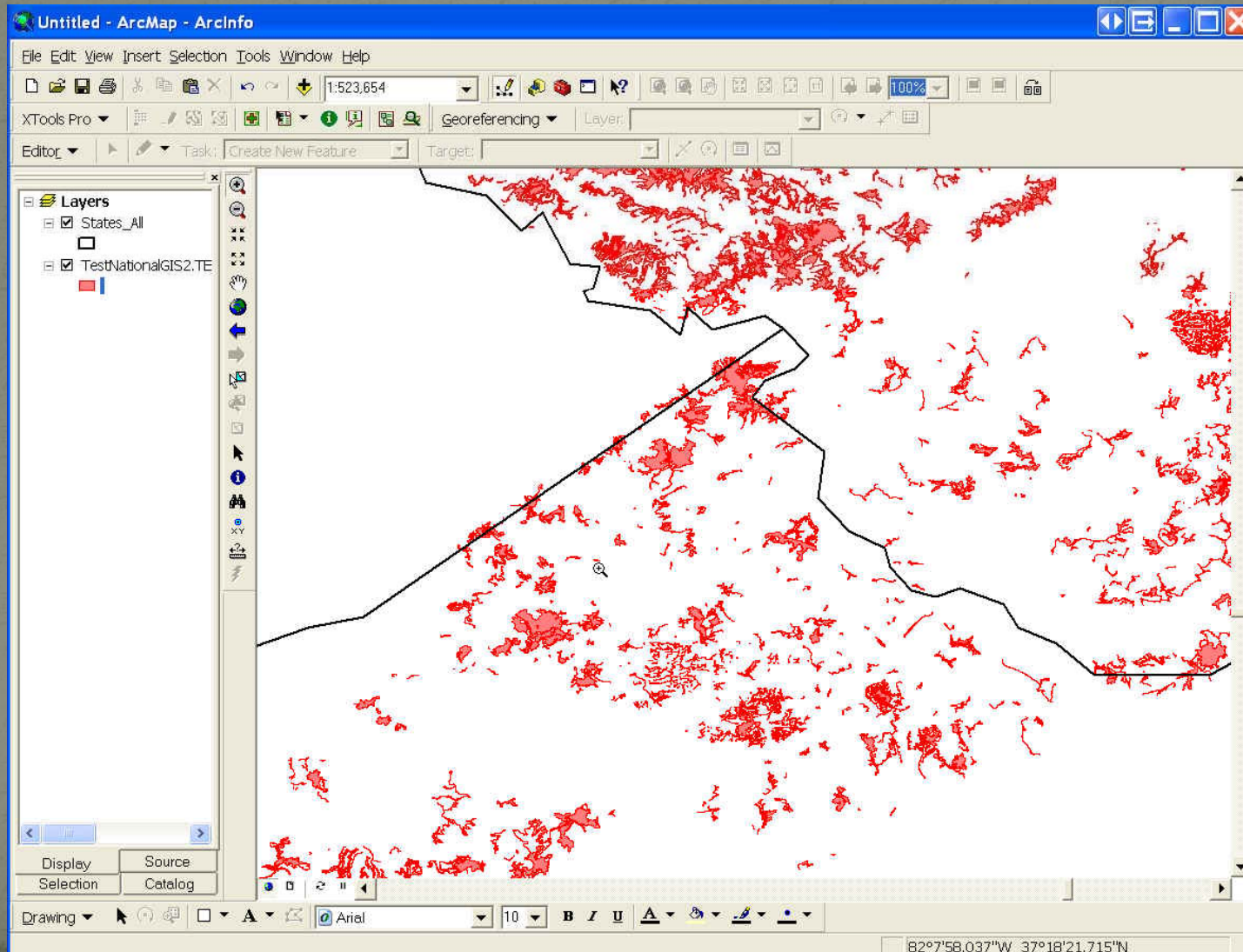




# National Feature Class – Eastern View



# National Feature Class – Zoom Near Virginia -West Virginia State Line





# Permit Attributes

The screenshot shows the ArcMap interface with a map of permit boundaries. The 'Identify' window is open, displaying the following attributes for the selected feature:

Field	Value
NATIONAL_ID	VA1101966
CONTACT	Daniel Kestner, Big Stone Gap, Virginia
PERMIT_ID	1101966
PERMITTEE	GREGORY S. BLANKENSHIP
PERMIT_STATUS	PP
DATA_STATUS	2/12/2008 10:03:09 AM
OBJECTID	7628
SHAPE	Polygon
SHAPE.area	0.000482
SHAPE.len	0.340694

# ETL Processing Statistics

- Total Permits Processed = 7966
- Total Time to Run ETL Tool = 5.5 minutes



# Lessons Learned

- Design and approvals for external connections can be more challenging than the GIS work
- Test small / test local
  - simplified single-purpose map service
  - simple geodatabase structures
- Scale up one step at a time
- Keep security as open as possible as long as possible
- Be mindful of the internal and external names of machines and how they affect access to ArcGIS servers



# More Lessons Learned

- When trying to troubleshoot replication, the error messages from ArcGIS are not good. The replication toolbar in ArcMap gives better error messages for troubleshooting.
- The sender and the receiver for replication should agree on the name of the replica since a replica with a duplicate name cannot be made and the error messages generated are not helpful. If one or the other party removes the replica registration from their system, they should inform the other party since there is no automated cleanup and the replication will fail.



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