

## Appendix 4

# Federal Oil and Gas Lease Stipulation Data Preparation

The bulk of the data preparation for lease stipulations consisted of data gathering, digitization, and compilation in a multi-layered GIS format (ESRI shapefiles). Federal Geographic Data Committee (FGDC) -compliant metadata for the resulting GIS layers were also created. GIS coverages from SMA land status, stipulations, and the analyses, as well as the associated metadata, are presented on the DVD-ROM accompanying this report.

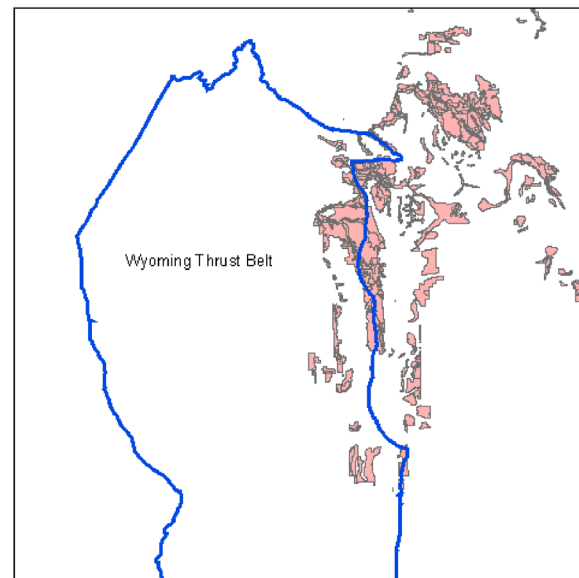
Where necessary, the shapefiles obtained from the Federal land management agencies were processed using ArcGIS version 9.2 software by matching specific leasing stipulations found in the guidance documents.

This Inventory is limited to those Federal lands within the aggregate resource play boundaries of the eighteen study areas, which are based on geology as defined in the USGS National Assessment of Oil and Gas Resources. The land status and stipulation shapefiles, which correspond to Federal land management agency jurisdiction boundaries, were “clipped” using the GIS to the appropriate study boundary. Some of the shapefiles fell into multiple study areas, in which case the clipping process was repeated for each area. The attribute tables of the compiled shapefiles were then queried for unique leasing stipulation values. The query results were then saved as separate polygon shapefiles. Each shapefile represents a unique stipulation value.

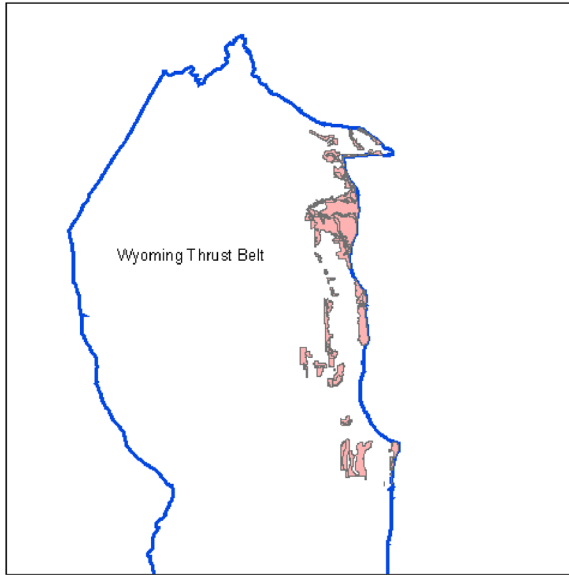
The following discussion of the specific data preparation steps uses the Wyoming Thrust Belt study area as an example:

1. The first step entails loading the study area (union of resource plays) boundary shapefile and the compiled stipulation shapefile into ArcGIS (Figure A4-1).

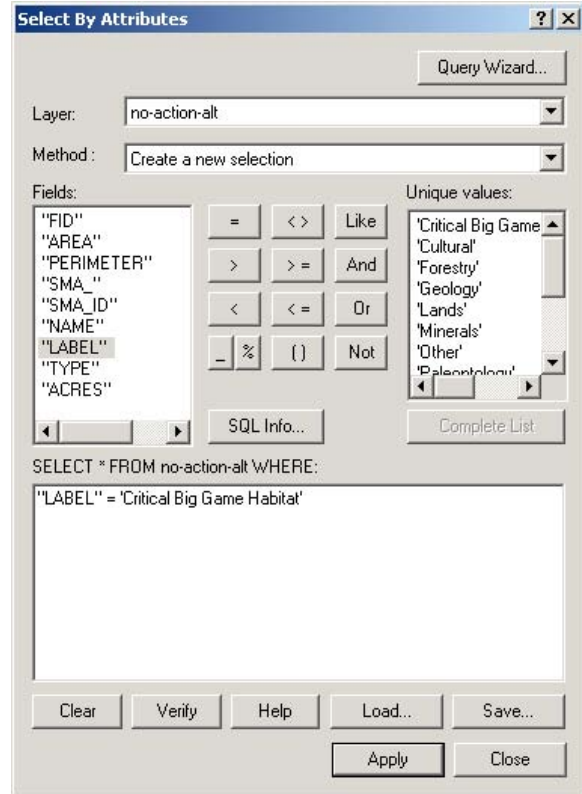
The next step in this process is to “clip” or cut the compiled stipulation shapefile to the study boundary. Figure A4-2 shows the GIS coverage after it has been clipped.



**Figure A4-1. Stipulation Polygons and Study Area Boundary**



**Figure A4-2. Example of Polygons after Clipping to Study Area Boundary**



**Figure A4-3. Query in ArcGIS for all “Critical Big Game Habitat” Stipulations**

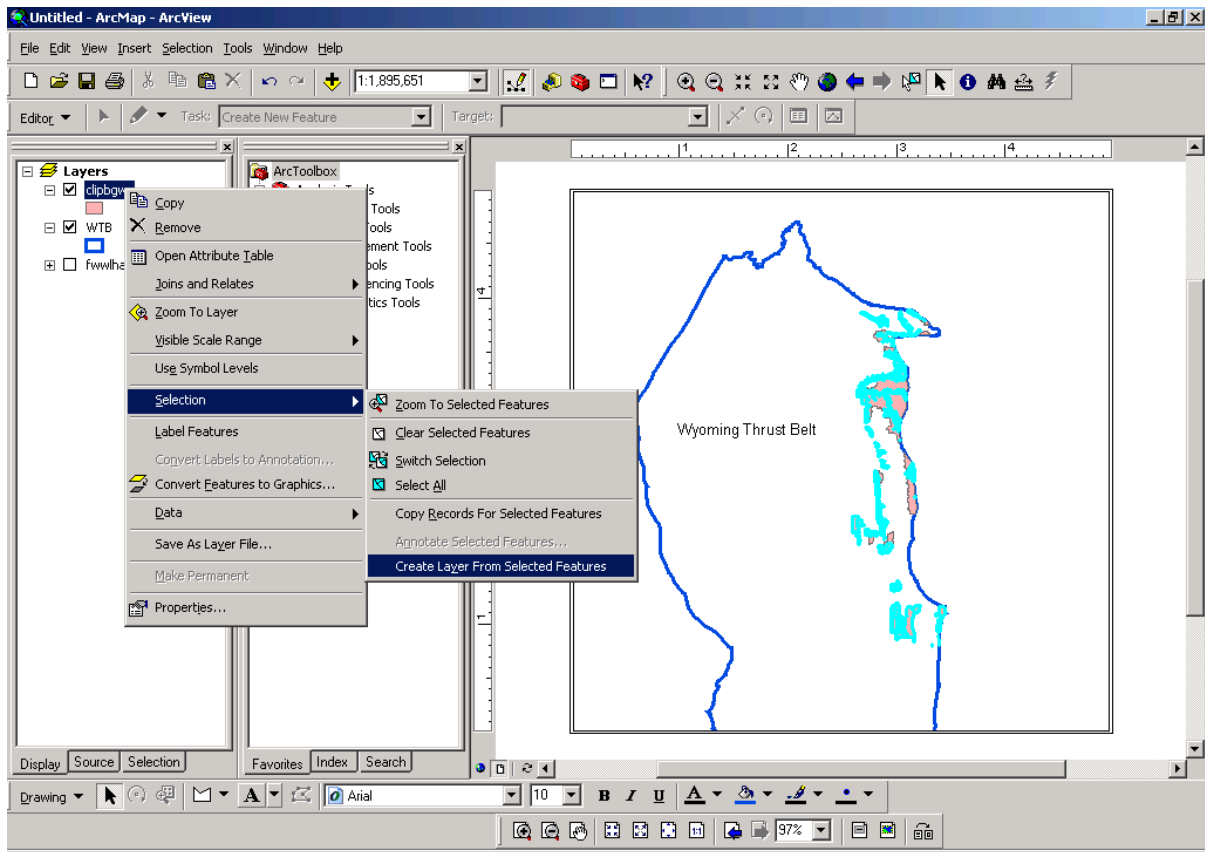
2. The compiled stipulation shapefile is then queried for unique stipulation attributes values as shown in the ArcGIS Query Builder (Figure A4-3). For this example, all polygons covered by the leasing stipulation “Critical Big Game Habitat” were selected. The highlighted rows in the attribute table (Figure A4-5) show which records are selected.
3. Using the ArcGIS function “Create layer from Selected Features,” a new shapefile is created that contains only polygons labeled with the attribute “Critical Big

Game Habitat”. Figure A4-5 shows the new shapefile that is created.

For certain stipulations, such as steep slopes, for which GIS data were not available from the BLM or FS offices, shapefiles were created from available data in conformance with stipulation requirements. For example,

FID	Shape	AREA	PERIMETER	SMA_	SMA_ID	NAME	LABEL
15	Polygon	0	0.00431	0	0	Historic Homesteads	Cultural
16	Polygon	0	0.00602	0	0	Historic Homesteads	Cultural
17	Polygon	0	0.00433	0	0	Historic Homesteads	Cultural
18	Polygon	0	0.00402	0	0	Historic Homesteads	Cultural
19	Polygon	0	0.0043	0	0	Historic Homesteads	Cultural
20	Polygon	0	0.00454	0	0	Historic Homesteads	Cultural
21	Polygon	0	0.0043	0	0	Historic Homesteads	Cultural
22	Polygon	0.01017	0.04966	0	0	Critical Big Game	Critical Big Game Habitat
23	Polygon	0.00718	1.09157	0	0	Critical Big Game	Critical Big Game Habitat
24	Polygon	0.01717	1.45917	0	0	Critical Big Game	Critical Big Game Habitat
25	Polygon	0.0001	0.05789	0	0	Critical Big Game	Critical Big Game Habitat
26	Polygon	0.00028	0.09199	0	0	Critical Big Game	Critical Big Game Habitat
27	Polygon	0.00033	0.08804	0	0	Critical Big Game	Critical Big Game Habitat
28	Polygon	0.00185	0.33017	0	0	Critical Big Game	Critical Big Game Habitat
29	Polygon	0.00358	0.35978	0	0	Critical Big Game	Critical Big Game Habitat
30	Polygon	0.00177	0.2752	0	0	Critical Big Game	Critical Big Game Habitat
31	Polygon	0.02178	2.50405	0	0	Critical Big Game	Critical Big Game Habitat
32	Polygon	0.00003	0.0235	0	0	Azabache Station	Recreation
33	Polygon	0.00004	0.02999	0	0	Bald Eagle	T&E Species
34	Polygon	0.00002	0.02162	0	0	Bald Eagle	T&E Species
35	Polygon	0.00002	0.02000	0	0	Bald Eagle	T&E Species

**Figure A4-4. Attribute Table Showing all “Critical Big Game Habitat” Polygons**



**Figure A4-5. New Polygons Representing Land with Leasing Stipulation for “Critical Big Game Habitat”**

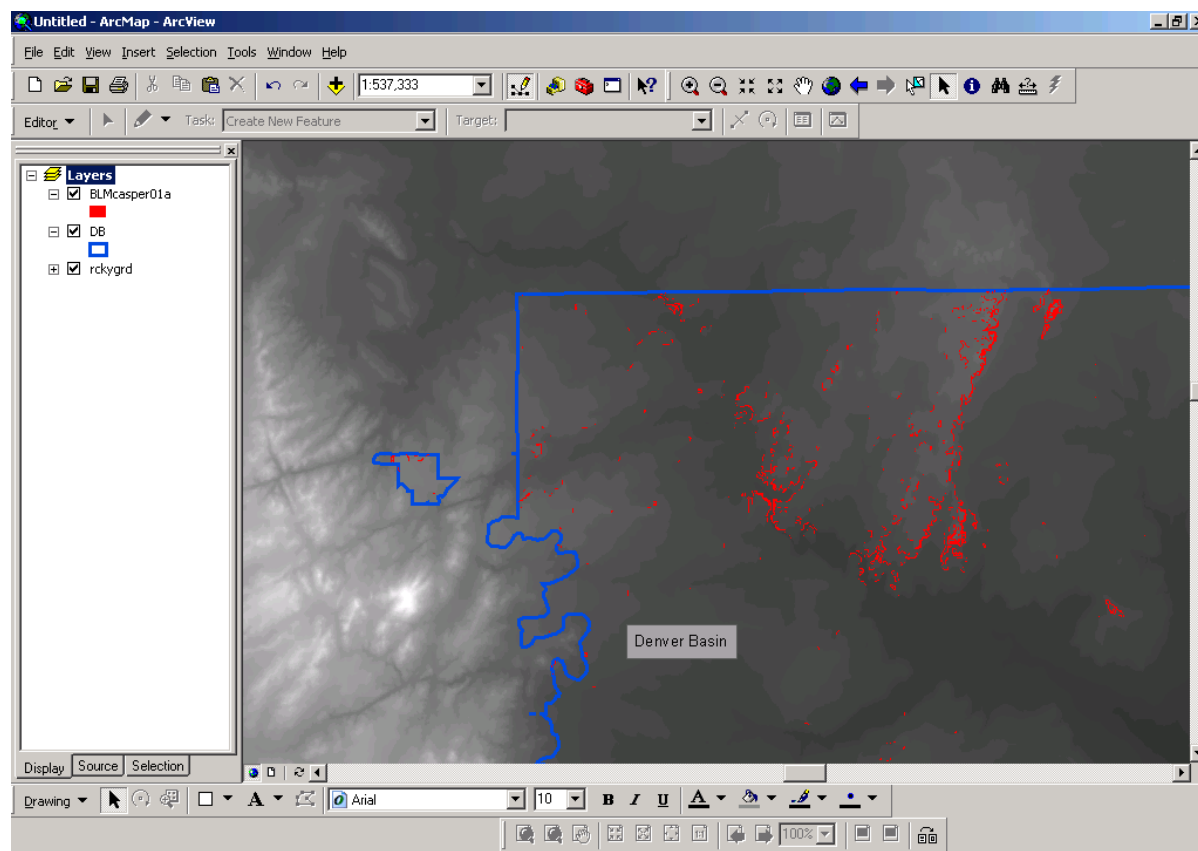
a typical steep slope stipulation impacts leasing in areas where slopes exceed 25 percent. Polygon themes were created from slope data derived from USGS 1:24,000 Digital Elevation Models (DEMs). These raster data sets contain elevation information on 100-meter grid spacing.

The USGS DEMs were first clipped to the BLM or FS jurisdictional area. In situations where more than one agency had the same stipulations, the DEM was clipped to the agencies’ combined jurisdictional area. A raster coverage was then created containing slope percentage data as calculated by ArcGIS. This coverage was then queried to isolate the areas covered by the stipulation (e.g., all areas steeper than 25 percent). The selected raster data was then converted to a

vector polygon coverage, and the coverage was coded and attributed as described above. Figure A4-6 shows the creation of steep slope polygons. The 100-meter USGS DEM for this portion of the Denver Basin is shown in shades of gray. The red theme represents the polygon shapefile showing areas with a greater than 25 percent slope.

Following the above procedures, the GIS shapefiles of the stipulations were coded with their respective descriptions from the various land use plans. These stipulations can be found in Appendix 11.

For quality control, completed lists of stipulations and their corresponding geometries were made available to the BLM and FS offices for their review. After



**Figure A4-6. Creation of Steep Slope Restriction Polygons**

soliciting responses, all feedback received from the offices was incorporated into the final datasets.

## A4.1 Differences Between the Phase III and Phase II Inventories

The Phase III Inventory is a cumulative effort and incorporates data from the Phase II Inventory. Significant differences between the two arise from four sources: (1) an increased number of basins, (2) inclusion of extrapolation areas to extend the Inventory to all onshore Federal lands in the U.S., (3) receipt of additional or revised data from field offices often in association with revised LUPs, and (4) inclusion of new (replacement) oil and gas assessments from the USGS completed as a part of their National Oil and Gas Assessment.

### A4.1.1 Methodological Changes

**Extrapolation.** To account for all Federal onshore resources, the EPCA Phase III Inventory accounts for areas and resources outside of the delineated study areas by extrapolation. The Inventory extrapolates land and resource categorizations based on the Federal land owner and access categorized in the detailed study areas. The resources from USGS assessments (see Appendix 6) outside of the detailed study areas were tallied by Federal land owner and assigned categorizations based on extrapolation from the detailed study areas. Further, where the total resource for a land use plan or office was less than 5 BCF (equivalent) within the study areas, the land and resource categorizations were extrapolated using the categorization by Federal land owner for that

basin. For more details on this process, see Appendix 9.

**Exception Factors Defined by Study Area.**

The EPCA III Inventory took into greater account the handling of exception factors for land use plans that span multiple study areas (for a complete explanation of exception factors, see Appendix 9.1 and Table A9-3). Certain stipulations in a given land use plan have different exception factors for different study areas, for reasons such as an increased concentration of a given species in a certain section of a planning boundary. Examples of areas that have different exception factors in different basins are the Glenwood Springs and Uncompahgre, CO BLM offices and the Kemmerer, WY BLM office. This change had only a minor impact on results.

**Study Area Boundaries.** The EPCA II study area boundary for Northern Alaska was greatly increased for the EPCA III Inventory. In EPCA II, the total Inventory area for Northern Alaska was about 25 million acres, while the EPCA III Inventory area is now nearly 40 million acres due to the inclusion of the USGS North Slope Middle-ground Area assessment. The Denver and Powder River Basins borders were also changed slightly from the EPCA II Inventory where a small area of what was the Denver Basin in EPCA II is now part of the Powder River Basin study area. In the EPCA II Inventory, the Paradox/San Juan Basin had been handled as a single study area. For the EPCA III Inventory, there are two distinct basins, the Paradox and the San Juan Basins (See Figure ES-1 for a complete map of the study areas, including updated basins). This change has been made to conform to the USGS NOGA province delineations.

**Resource Allocation.** Slight changes have been made in the EPCA III Inventory for oil and gas resource allocation due the inclusion of more plays overlapping from new study areas. The Paradox Basin has additional resources from the Eastern Great Basin. In the Uinta-Piceance Basin, an additional play was included in the analysis that was not in the EPCA II Inventory. The Denver Basin received an additional resource-dense play from the Williston Basin, and the Powder River Basin also received an additional play from the Williston Basin.

**A4.1.2 Additions to the Phase III Inventory**

**Additional Data Received from Offices.**

For the Phase III effort, additional data were received from some offices. Each office inventoried in Phase III was canvassed to supply any additional GIS data that had not been in the Phase II Inventory, and many had minor updates for data that had previously not been available. Conversely, some offices had significant changes or new GIS data, including Farmington, NM BLM; Taos, NM BLM; Grand Junction, CO BLM; Buffalo, WY BLM; Lander, WY BLM; Pinedale, WY BLM; Rock Springs, WY BLM; all UT BLM offices (replacing the “Lopez Project”, see below), Bridger-Teton NF; Uinta NF; Beaverhead NF; George Washington NF; Nebraska NF; Thunder Basin National Grassland; the National Forests of Alabama and Mississippi; North Dakota Game and Fish Department; and Big Cypress National Preserve.

In addition, an updated national GIS layer for Wilderness Areas, Inventoried Roadless Areas, Special Designated Areas, National Conservation Areas, Wilderness Reinventory Areas, Incorporated Towns and Cities, Wilderness Study Areas, Research Natural

Areas, National Monuments, National Wildlife Refuges, Wild and Scenic Rivers, and National Scenic and Historic Trails was provided by the BLM's National Landscape Conservation System and the USDA-Forest Service.

New GIS data for coastlines from the BLM were used in the EPCA III Inventory. The coastlines are now analyzed in greater detail than in the EPCA II Inventory, thus giving slightly different results for study areas in Alaska, Florida, and the Appalachian Basin.

Updated Land Status GIS data was used in the Phase III Inventory for Northern Alaska and the Powder River Basin.

**Areas Deferred from Leasing Until Completion of an Updated Land Use Plan.** As a land use plan is under revision, an office may decide to defer any lease applications until completion of the new plan. The Northeast NPRA BLM planning area, and the San Juan and Santa Fe NFs are examples where leasing decisions are suspended until completion of a new plan or plan revision, and are classified as NLA\LUP for the EPCA III Inventory. Also, the Roan Plateau area in the Glenwood Springs, CO BLM office was not completed at the time of this Inventory, and is categorized as NLA\LUP.

**Land Use Plans Now Subject to Stipulations.** In the EPCA II Inventory, there were a number of offices undergoing planning and, as such, they were listed as NLA\LUP. Several of these plans have been completed and signed into effect, and are now incorporated into the Phase III Inventory. Examples of such areas are the Dillon, MT and Gunnison, CO BLM offices, Bighorn NF, Caribou NF, and the Jack Morrow Hills Core Area of the Rock

Springs, WY BLM office. The entire Humboldt-Toiyabe NF was NLA\LUP in the EPCA II Inventory, but now sections of the Forest are NLA or NSO, while other sections remain NLA\LUP until further NEPA analysis is completed.

**New Land Use Plans Superseding EPCA II Land Use Plans.** The EPCA II Inventory contained several land use plans that have since been superseded by new or different plans. In the Salt Lake, UT BLM office the Bear River EA, supersedes the Isotract and the Randolph and Park City MFPs, which were used in the EPCA II Inventory. Likewise, new land use plans were analyzed in EPCA III for Monongahela NF and Wayne NF, among others. While most of the new plans contain similar restrictions on oil and gas leasing, there are also differences that lead to different land access categorizations for areas within the plan boundary.

**Use of Discrete Land Use Plans.** In the EPCA I and II inventories, the Utah BLM Lopez Project had been provided by the UT State Office of the BLM. For the EPCA Phase III Inventory in the Paradox and Uinta-Piceance Basin areas in Utah, discrete land use plans, where available, were used in place of the Lopez Project. GIS data associated with the discrete plans were incorporated into the Inventory, thus creating different land access categorization results for these study areas.

#### **A4.1.3 Other Changes for Phase III**

**Refined Stipulation Lists.** For some land use plans, the stipulations lists were refined since Phase I and/or Phase II of the Inventory. The Montana Thrust Belt is one area in which further analysis of the LUPs resulted in alterations to the stipulation lists.

There are also updates to the stipulations list in the Miles City, MT BLM district.

**Analytical Errors.** There were about 1300 stipulations having GIS data in the Phase II Inventory. A small number of miscellaneous analytical errors were made that slightly impacted the results presented in published version of that Inventory. After further analysis of the land use plan and consultation with the specific management unit, several changes were made to stipulations in the EPCA II Inventory. The errors are:

- In the Alabama NFs, two stipulations were changed to conditions of approval, and several other stipulations were added.
- In Carson NF, a stipulation was added for riparian areas. Also, the LAC for stipulations 005 and 006 were reversed in the Phase II Inventory.
- In Ashley NF, stipulations were added for riparian areas, steep slopes, and wetlands.
- After consultation with the field office, the San Juan, CO BLM added several stipulations.

**Publication Errors.** In the Phase II Inventory publication, the Powder River Basin Study Area – Federal Land and Oil and Natural Gas Resources by Access Category table was displayed incorrectly. The table for the Montana Thrust Belt Study Area was displayed instead. In the PRB, four plays had erroneous listings for resource values (but were analyzed correctly in modeling).

**Rendering Errors.** In the EPCA II report, reserves growth for both oil and gas resources were not displayed in maps for the Uinta-Piceance Basin, Powder River Basin, Wyoming Thrust Belt, Southwestern Wyoming and Black Warrior Basin study areas. Despite not being shown in the map, the resource values were included in the analysis.

**Name Change.** The Southwestern Wyoming study area was previously called the Greater Green River Basin in the EPCA II Inventory. This change was made to be consistent with USGS nomenclature.

