

Restoration Work in the New World Response and Restoration Project

Summary of Spatial Data and Spatial Project work from 1996 through 2008

Henry Shovic, Gallatin National Forest Soil Scientist

May 21, 2008

This summary references digital data contained in the external USB hard drive titled: “MineralsSpatialDataShovic050108”. My staff and I were responsible for developing basic spatial data for planning purposes and planning analysis, and Maxim (a consulting firm) was primarily responsible for engineering level analysis and execution of plans. We cooperated on many of these projects with Maxim.

We participated in a wide variety of projects. These included site-specific visualization, grizzly bear effects, road restoration, wetlands mapping, mine dump restoration, invasive weed analysis, groundwater analysis, and surface water quality analysis.

However, the three most important were the creation, display, analysis, and maintenance of spatial data representing 1) patented and unpatented mining claims, 2) roads, and 3) mine dumps. These were developed by the Gallatin National Forest from numerous data sources described in their metadata. Each has a spatial database and an associated tabular database of attributes. They are described under the folders “wsclaims”, “wsroads”, and “wsminedumps” below.

ARCGIS considerations:

ARCGIS map projects all work for the three folders “wsclaims”, “wsroads”, and “wsminedumps” below. However, all maps are designed for ARCH E or 36” wide by 48” high paper on the printer, so must be set for that size in the Page Setup dialogue before they will print properly. Furthermore, the “MineralsSpatialDataShovic050108” external USB drive must be mapped to drive “I” for ARCGIS projects to locate all the relevant data. All paths must be retained. All ARCGIS projects are saved in “absolute” terms. All data are in UTM 12 NAD27 projection. Some older maps are in the older, obsolete ARCVIEW format. These can be converted to ARCGIS projects using ARCGIS if they are needed.

Maps:

The main “wscb” folder contains many files, and many ARCGIS map projects. The projects can be used to make or modify existing maps. These maps range in year from 1996 to 2006. Many folders contain .pdf files of maps (which can be printed from ADOBE READER using ARCH E as page size) and .rtl files of maps which can be printed from the ARCGIS PRINT program. They have been copied to the folders “CopiesOfPDFMaps” and “CopiesOfRTLMaps” for convenience. Many .jpg images that represent maps are copied to “CopiesOfJPGMapsAndImages”.

Maps published by the Gallatin N.F. all have a source document listed on the map. Search for that name to find the map projects relevant to that map. Also, a list of all maps produced before mid-2003 is included in the folder “PublicationOfDataIn2003” and is titled “NWmapsAbbreviatedForPublication.rtf”.

New World Data:

Important Note on Data Publication

The folder “PublicationOfDataIn2003” includes this organized and documented set of spatial and tabular data as of March 7, 2003. It is described below. Not all New World data described below are in this publication. Most of the data in the publication, however, is duplicated in the folders below.

There are three exceptions. The patented claims attribute data base (CLAIMS.MDB) was updated after this publication, and is therefore more accurate than that used in the “**PublicationOfDataIn2003**” folder. The roads database (ROADS.MDB) was also updated in 2007 for a few name errors. Finally, both databases were updated in 2008 to correct report source queries, but no data were altered.

To maintain data integrity, these three tabular database files have been renamed with “bak” appended to the prefix of the file name.

Folders

*With exception of reference data described at the end of the document, New World data are all in the folder “**I:\fsfiles\fstmp\so\resource\isac\lineback\newworld**”. All folders described below are within this path.*

“**I:\fsfiles\fstmp\so\resource\isac\lineback\newworld\nwslides**” has many images from many sources on the New World project, including Walt Allen’s posters on the cultural history of the area and many reclamation review pictures.

“**I:\fsfiles\fstmp\so\resource\isac\lineback\newworld\wsch**” is the main New World data folder. There are many folders under this one. Most are ARC/INFO coverages, and most are described and included in the folder “PublicationOfDataIn2003” described below. The ARC/INFO coverage and grid folders are: 10mcontour, 94_monitor, acidbase, adits, blkwar_c, contour40, contour100, contour200, contouranno, cookedem, cookehs, demclip, faults, forest_rds, highways, hist_district, lakes, line, nwcontour, nwcookedoq, nwcultureclip, nwsoils, nwstline, nwstudy, nwstudyarea, plss_cooke, secogps, seccogps_utm, sectline, slopepoly, slopepoly2, streams, strsingle, toptext_exp, and water_us.

All non-coverage folders are described below.

“**archive**” contains misc. coverages and other data of unknown application.

“**correspondence**” contains two reclamation posters in Powerpoint format.

“**demmetadata**” contains metadata for the dem used in this project.

“**dir_databases**” contains old mail lists and old versions of databases.

“**dir_dxf**files” contains original dxf files (autocad files of various mining activities)

“**dir_exportfiles**” contains ARC/INFO export files for various coverages.

“**dir_images**” contains two repository plan images.

“**dir_textfiles**” contains many text files for various posters and maps.

“**dir_zipfiles**” contains old zip files of various data. These are generally obsolete.

“**documents**” contains many project documents for New World, including Powerpoints. These are generally pre-2003. They include cultural features, analysis of minedumps, and revegetation documents.

“**Glengarry**” includes 3D or perspective images of underground workings around the Glengarry adit.

“**gps**” contains misc. GPS-based shapefiles of roads.

“**library**” contains reference spatial layers for various maps.

“**PublicationOfDataIn2003**” has all spatial and tabular data as of March 7, 2003. This also has descriptions and copies of all important spatial data. The metadata and description of this folder is included below as Appendix One. The three critical databases CLAIMS.MDB, ROADS.MDB, and MINEDUMPS.MDB are NOT included. These three have been updated since this publication and are included in the folders “**wsclaims**”, “**wsroads**”, and “**wsminedumps**” and not in this publication folder.

“**StillwaterWetlandStudy**” contains partial analysis for a 2003 study done by MSU Dept. of Geology. A .jpg image is included showing a 3D color image of the wetlands. ARCMAP projects no longer have supporting data.

“**usgsquads**” contains all digital usgs topographic quads used in New World projects.

“**VisualizationOfNewWorldArea**” contains a 2003 3d map of the New World area. These ARCMAP project does not work (data were moved), but a jpg is included exported from that project that can be printed or displayed.

Workspaces

The remainder of folders represent workspaces for projects. They begin with “ws”. *The year in parenthesis indicates the probable last year of modification and update.*

“**wsclaims**” (2008) contains analysis and data for patented and unpatented mining claims in the New World district. ARCMAP map projects work in this folder. However, they may need to be reformatted for whatever printer is used when they are opened.

The database CLAIMS.MDB has a set of pre-defined reports suitable for printing.

Patented Ownership – the PAT_CLAIM ARC/INFO coverage AND CLAIMS.MDB

The coverage PAT_CLAIM has a region feature class named OWNER. This feature contains each patented claim in the New World District. The associated database claims.mdb contains data concerning names of claims, owners, percent owned, and district property. District property refers to land in Forest Service ownership plus lands in patented claims to which the Forest Service owns surface rights as defined in the New World Consent Decree of 1998. Non-district property is that where no Forest Service surface rights are present. These lands are generally patented claims not part of the New World Consent agreements. See PAT_CLAIM.HTML under “PublicationOfDataIn2003” for more details.

The ACCESS (tm) database CLAIMS.MDB may be linked to the PAT_CLAIM coverage via the NAME attribute in both the region.owner table and the CLAIMS.MDB. Accuracy of claim boundaries is described in this database. Note that CLAIMS.MDB is updated from the one in “PublicationOfDataIn2003” and is dated 5/9/2008 when reports were updated, and the table PatentedClaims was updated 9/26/2007 with claim data on Lizzie and Lizzie 2 claims.

Unpatented Ownership – the UNPAT_CLAIM ARC/INFO coverage.

This coverage contains district unpatented mining claim locations for claims in the New World Mining District. No name attributes are used. See UNPAT_CLAIM.HTML under “PublicationOfDataIn2003” for more details.

“**wscomopit**” (2002) has various engineering contour maps and 3D images of the como area, as well as some maps where tunnel drawings were matched to surface features on photos.

“**wscultural**” (2002) has various shape files and pictures of cultural analysis done in 2002. ARCVIEW projects are included.

“wsgeology” (2003) has a variety of geological projects and spatial data. This includes maps of acid-producing outcrops and acidic soils.

“wsgrids” (2003) contains a number of grids of elevation, contour, and hillshade at varying resolutions.

“wsGrizzlyBearData” (2006) contains various spatial files of grizzly-bear related analysis.

“wsmclarencloseup” (2003) contains spatial data and images of various engineering contours, mine maps, overlaid and rectified to ortho-aerial photos for the McClaren pit area.

“wsminedumps” (2008) contains spatial and attribute data on mined areas, either mine waste dumps, processing waste dumps, or other areas disturbed by mining, such as exploration pits or trenches. Spatial were last updated in 2002. *Reclamation status and queries in the associated tabular database were updated in 2008.*

The database MINEDUMPS.MDB has a set of pre-defined reports suitable for printing.

Minedumps – the ARC/INFO coverage NWMINEAREAS and the database MINEDUMPS.MDB

Initial spatial data were created by digitizing all study area minedumps visible on 1:15,840 color aerial photography (magnified to 1:3,000), identified on Crown Butte Mining Inc. maps, or observed in the field. They were then verified in the field. There are 194 minedumps as of June 2001. There are 210 minedumps as of 092402. This change is due to addition of eight minedumps from Maxim field work, removal of six dumps that were mis-called on aerial photos, and addition of 15 new dumps in summer of 2002 field work. There is an associated ACCESS (tm) database that has many attributes important to reclamation. Additional metadata is in NWMNMETADATA.HTM under the folder **“PublicationOfDataIn2003”**. Each field is described in the database table design view in the ACCESS database. The key field **“IDENTIFIER”** is used to link the attributes to the ARC/INFO coverage.

“wsnhd” (2003) contains National Hydrologic Dataset stream spatial data

“wsrepository” (2006) contains spatial data on the New World repository and other recent disturbances.

“wsrepublic” (2003) contains spatial data and jpg’s (images) of the Republic mine site, the repository, and the general New World area.

“wsroads” (2008) contains extensive spatial data, analysis documentation, and ARCVIEW projects for various maps. All disturbances related to the movement of four-

wheel vehicular traffic are included in this database. The “**notes**” sub-folder has documentation on edits and versions.

Road status including reclamation status was last updated in 2008 and road management was last updated in 2006. The ROADS.MDB has a report listing road attributes.

The ARC/INFO coverage NW_RDS and the attribute database ROADS.MDB are the critical data in this folder.

Initial spatial data were created by digitizing all study area roads visible on 1:15,840 color aerial photography (magnified to 1:3,000), identified on Crown Butte Mining Inc. maps, or observed in the field. Roads were digitized as arcs on a geo-referenced orthophoto background with an average accuracy of + 10 meters (based on GPS reference.) Ninety percent of these have been field-verified as of October of 2002. Newly constructed roads (e.g. to the repository, topsoil source water tank, and gravel pit) were digitized in 2002. One road route was removed in 2002 based on field verification. Reclamation status (nwReclaimEvents, updated in 2008) and management recommendations (NWRoadMgmtEvents, updated in 2006) are tables contained in the ACCESS database ROADS.MDB. These are used as events that attach to the route coverage.

Each New World road is actually a "route" which is an ARC/INFO term for a grouping of arcs on the landscape to fit what is reasonably thought of as a "road." Routes have well-defined endings and are normally continuous. Naming conventions, road names, extent, and location of routes were chosen to be generally consistent with Forest Service travel routes defined at a scale of 1:24,000. Since the New World project needs a more detailed coverage, routes were added and some were modified from the Forest Service data, based on field review and delineation on aerial photography at a scale of 1:3,000. Some historical roads are intermittently visible on the ground or on aerial photos. These are shown as discontinuous routes.

The ACCESS (tm) database ROADS.MDB has data for each road. The database links to the roads route of the nw_rds coverage via the IDENTIFIER attribute. Each attribute in ROADS.MDB is described in the table design view. More metadata are in the file roadsmetadata.htm in the publication folder “**PublicationOfDataIn2003**”.

The sub-folder “**roads_analysis**” contains 2001 road analysis for New World, including documents characterizing roads for reclamation potential, 3D views, and maps.

A WORD document titled “New World Roads Analysis08091.doc” contains extensive analysis on road reclamation.

”**wstmdl**” (2002) contains images of TMDL water analysis.

“**wstransform**” (2002) contains analysis and documentation of the initial drawing data we received from Crowne Butte Mining and its transformation to GIS.

“**wstredennic**” (2002) has various data about the Tredennic minedumps. No maps.

“**wsveg**” (2002) has various background data for vegetation and habitat types in the New World Area. No maps.

“**wsweeds**” (2004) has weed spatial data. No metadata or maps are present.

“**wswells**” (2002) has USGS, Crowne Butte, and Maxim groundwater well spatial data as analyzed by the Gallatin N. F. There is an ARCVIEW project for maps. The “**notes**” folder describes the data and history.

“**wswetlands**” (2003) contains wetland spatial data gathered from Crown Butte and other sources. There are some ARCGIS project maps in this folder.

“**wswq**” (2003) contains extensive water quality analysis, including Kriging for spatial determination of trace elements, water quality, ferricrete deposit locations, coverages on geology, wells, surface water sampling stations. Most of this analysis was by Wendi Urie and Taylor Greenup.

Reference layers

“**I:\fsfiles\fstmp\so\resource\isac\lib**” contains reference layers.

“**I:\fsfiles\fstmp\so\resource\gyagyccmaps**” contains reference layers.

“**I:\fsfiles\ref\library\gis\gallatin**” contains Gallatin National Forest reference layers used at the time of the New World project. Projection is UTM 12 NAD 27.

Other Minerals Projects:

“**I:\fsfiles\fstmp\so\resource\isac\lineback\other**” has spatial and other data for the following projects.

- Stillwater PGM mining claims
- Johnson Canyon and Mica Mine GPS data and maps
- Yankee Jim Canyon perspective views

Some of these projects are in ARCVIEW.

Appendix One

Spatial Data Publication
METADATA
New World Mining District Response and Restoration Project
Interagency Spatial Analysis Center
March 8, 2003

by Henry Shovic and Wendi Urie
hshovic@fs.fed.us, wurie@fs.fed.us
406 587 6714, 406 587 6964

The following list contains spatial data useful in the New World Mining District Response and Restoration Project. It is current as of February 1, 2003. It includes recent reclamation, road construction, and recently acquired data on acid outcrops and soils with high-metal content.

Projection of all coverages is UTM Zone 12 NAD27 meters in ARC/INFO 7.2 format.

Contours - CONTOUR40 CONTOUR200

Contour coverages were derived from 30meter digital elevation models. CONTOUR40 has 40 foot contour intervals and CONTOUR200 has 200 foot contour intervals.

Digital Elevation Models - NWSTUDYDEM and NWSTUDYHS

NWSTUDYDEM is a USGS 30 meter digital elevation model clipped to the New World District study area.

It is an ARC/INFO GRID. Elevation units are in meters.

NWSTUDYHS is a hill shade created from NWSTUDYDEM. IT is also an ARC/INFO GRID.

Geology - ACIDOUTCROPS

Water quality impacts in the area are related to the production of acidic solutions from sulfide-bearing rocks. Acid-producing potential is concentrated in locations where these rocks are exposed by relatively recent disturbance. Stream impacts increase where roads channel sediment generated from these kinds of rocks. Acid-producing areas are displayed on a geology map developed by the Crown Butte Mining Company in the early 1990's. This map is at a scale of 1:12,000 and was created using water and rock chemistry data, field observations, aerial photography interpretation, and existing published geologic maps. The source map is titled " New World Project Known and Possible Acid Generating Areas And Outcrop Plan Map Meagher and Pilgrim

G:\DATA\Henry\Henry words\Forest Service\CESU\Portfolio\GallatinMineralsDataFromShovic052108.doc Created on 5/21/2008 3:03:00 PM

Limestones, Scotch Bonnet Diorite and Precambrian Granitic Rocks." Edited by Alan Kirk, MAXIM on 010403.

All the following soil - geology coverages were developed from small scale maps provided by Alan Kirk (Maxim Inc.) on 09-01-2002, updated by Alan Kirk on 010403.

The paper maps are from an un-published report by Bear Creek Exploration in 1974. Original field sheets are in Cooke City USFS files @ a scale of about 1' to 500'. This report is not available.

Approximate scale of source mapping is: 1:30,000. Data should not be used for analysis at scales larger than that. Secondly, the georeference data provided on the maps was section lines and claim boundaries. Both were only approximately correct. Data was digitized on screen with georeferenced claims, a digital orthophoto and section lines at a scale of 1:10,000. Source maps were copies of apparent CAD drawings with hand-colored polygons, further reducing accuracy.

Geology: coverage SOILMOLYAN

Geochemical sampling 1974 figure 8. Molybdenum 300' spacing data includes 10-60 ppm, 60-149 ppm, > 1149 ppm, and other (assume < 10 ppm) in study area taken from the map "Approximate boundary of area sampled" on a copy of a partial copper map.

Geology: coverage SOILCOPPERAN

Geochemical sampling 1974 figure 7. Copper 300' spacing data includes 300-2000 ppm, > 2000 ppm, and other (assume < 300 ppm) in study area taken from the map "Approximate boundary of area sampled" on a copy of a partial copper map.

Geology: coverage SOILGOLDAN

Geochemical sampling 1974 figure 9. Gold 300' spacing data includes > 0.27 ppm, and other (assume < 0.27 ppm) in study area taken from the map "Approximate boundary of area sampled" on a copy of a partial copper map.

Geology: coverage SOILGEOAN

Geochemical sampling 1974 figure 8. Molybdenum 300' spacing data includes geochemical anomalies and ore reserves from the Molybdenum map in study area taken from the map "Approximate boundary of area sampled" on a copy of a partial copper map.

Minedumps - NWMINEAREAS and MINEDUMPS.MDB

Initial spatial data were created by digitizing all study area minedumps visible on 1:15,840 color aerial photography (magnified to 1:3,000), identified on Crown Butte Mining Inc. maps, or observed in the field. They were then verified in the field. There are 194 minedumps as of June 2001. There are 210 minedumps as of 092402. This

change is due to addition of eight minedumps from Maxim field work, removal of six dumps that were mis-called on aerial photos, and addition of 15 new dumps in summer of 2002 field work. There is an associated ACCESS (tm) database that has many attributes important to reclamation. Additional metadata is in NWMNMETADATA.HTM Each field is described in the database table design view.

Orthophoto - NWSTUDYOR.JPG

This is a 1:24,000 scale digital orthophoto obtained from the USGS.

Ownership - PAT_CLAIM AND CLAIMS.MDB

The coverage PAT_CLAIM has a region feature class named OWNER. This feature contains each patented claim in the New World District. The associated database claims.mdb contains data concerning names of claims, owners, percent owned, and district property. District property refers to land in Forest Service ownership plus lands in patented claims to which the Forest Service owns surface rights as defined in the New World Consent Decree of 1998. Non-district property is that where no Forest Service surface rights are present. These lands are generally patented claims not part of the New World Consent agreements. Reclamation and other land-disturbing activities are ongoing on District property. Generally, the District property must be restored prior to spending funds on non-District property. The ACCESS (tm) database CLAIMS.MDB may be linked to the PAT_CLAIM coverage via the NAME attribute in both the region.owner table and the CLAIMS.MDB.

See PAT_CLAIM.HTML for more details.

Ownership - UNPAT_CLAIM

This coverage contains district unpatented mining claim locations for claims in the New World Mining District. No name attributes are used.

See UNPAT_CLAIM.HTML for more details.

Soils - GALLSOIL.ZIP

This zip file contains the Gallatin NF soils data and associated metadata. Please read files contained in this zip file for further information.

Roads - NW_RDS and ROADS.MDB

Initial spatial data were created by digitizing all study area roads visible on 1:15,840 color aerial photography (magnified to 1:3,000), identified on Crown Butte Mining Inc. maps, or observed in the field. Roads were digitized as arcs on a geo-referenced

orthophoto background with an average accuracy of + 10 meters (based on GPS reference.) Ninety percent of these have been field-verified as of October of 200. The remainder will be verified in 2003 and 2004. Newly constructed roads (e.g. to the repository, topsoil source water tank, and gravel pit) were digitized in 2002. One road route was removed in 2002 based on field verification. Reclamation status (nwReclaimEvents) and management recommendations (NWRoadMgmtEvents) are tables contained in the ACCESS database ROADS.MDB. These are used as events that attach to the route coverage.

Each New World road is actually a "route" which is an ARC/INFO term for a grouping of arcs on the landscape to fit what is reasonably thought of as a "road." Routes have well-defined endings and are normally continuous. Naming conventions, road names, extent, and location of routes were chosen to be generally consistent with Forest Service travel routes defined at a scale of 1:24,000. Since the New World project needs a more detailed coverage, routes were added and some were modified from the Forest Service data, based on field review and delineation on aerial photography at a scale of 1:3,000. Some historical roads are intermittently visible on the ground or on aerial photos. These are shown as discontinuous routes.

The ACCESS (tm) database ROADS.MDB has data for each road. The database links to the roads route of the nw_rds coverage via the IDENTIFIER attribute. Each attribute in ROADS.MDB is described in the table design view. More metadata are in the file roadsmetadata.htm.

Section Lines - SECTLINE

Section lines were obtained from USGS 1:24,000 quadrangles via the USFS cartographic feature file program. This is a line file (sections are not polygons) and contains an annotation attribute called NUMB which contains section numbers.

Streams - STREAMS

Streams were originally obtained from USGS 1:24,000 quadrangles via the USFS cartographic feature file program. Missing streams were added by digitizing on screen using the 1:24,000 scale digital orthophoto. An annotations feature class called NAME contains each stream name. This coverage was updated in 2002 to include more tributaries.

Surface and Groundwater Monitoring Sites - H2OFINAL and USGSDAISY

These coverages are maintained and stored at MAXIM, Inc. and are not available through us.

Watersheds - NWWATERSHEDS

Eight watersheds are partially or completely contained in the study area. These are the Clark's Fork, the Stillwater, Daisy, Fisher, Miller, Sheep, Soda Butte, and the West Rosebud watersheds. These are used as sampling units for water quality studies, and drain to a number of important streams both in Montana and Wyoming. Data were digitized at an approximate scale of 1:12,000.

Wetlands - WETLANDSC

A reconnaissance wetlands inventory was created in 2002 from existing CAD drawings provided by CBMI. It was reviewed in the field in 2002. Based on these results, we determined the coverage is sufficient for broad planning, but is not accurate enough for project work. The file "Wetlands Coverage for the New World Area metadata.htm" has more information.

Maps

The current versions of the following maps are enclosed. These are RTL files which can be printed on an HP plotter. They are all E size (36" w x 48" h.)

Green landscape road/minedump/streams plot vs 1.9 nwgreenplot0923.rtl

Map showing acid outcrops, high-metal soils, and roads version 1.1
nwacidsoilroads111202vs11.rtl

We have included a listing of all the maps we have produced for the New World Project. This is an rtf file called "NWmapsAbbreviatedForPublication.rtf" Please call if you want a copy of any of these maps.