Vermont Center for Geographic Information, Inc.

58 South Main Street, Suite 2
Waterbury, VT 05676
Phone 802.882.3000 Fax 802.882.3001

Tuesday, August 19, 2014

Report of Findings:

Land Area by Category above 1500' & 2500' Elevation in Vermont

OVERVIEW & RESULTS

The objective was to calculate the overall acreage of land, equal to or above both the 1500' and 2500' elevations within the VT state boundary and produce a breakdown of "Federal", "Municipal", "Other/Unknown", "Private" and "State" land acreages using the best available, though not yet publicly available 2012 conservation lands data.

VCGI performed a similar analysis in February 2013 for land area in Vermont above 2,500' (vs. 1500') using the publicly available 2009 Conserved/Publics land data layer "CONSPUB" and the 20' contour ("ElevationContours_CN20T") datasets.

In order to make both elevation threshold results comparable, both have been rerun using the same data. The original analysis estimated 188,730.6 acres of conserved land above 2500' vs. the 161,612.9 acre estimate in the current analysis. This difference is largely attributed to the updated conservation lands data. Visual inspection of the old vs. new elevation data revealed no identifiable differences.

The current analysis is substituting the 2012 Vermont Conserved Lands Database (VCLDB) updated by The Nature Conservancy (TNC) for "CONSPUB" and the raster elevation dataset "ElevationDEM_DEM10M" for the 20' contours. The latter was done to simplify the effort at no cost to accuracy.

The updated 2012 version of the input data will be made public on the Vermont Geographic Information System (VGIS) pending completion of a collaborative effort named the VERMONT CONSERVED LANDS DATABASE (VCLDB). The VCLDB will have a normalized database schema and domain values etc. and will be populated with data sourced from the members "child" versions of the 2009 source data. The VCLDB is an ongoing project of the University of Vermont, Spatial Analysis Lab and cooperating organizations which include The Vermont Land Trust, The Nature Conservancy, the Vermont Housing and Conservation Board, the Vermont Agency of Natural Resources, and regional planning commissions throughout the state.

The two primary input datasets were:

1. ElevationDEM_DEM10M - USGS National Elevation Dataset (NED) 10 meter DEM; and
2. Vermont Conserved Lands Database – Latest available version (2012) provided by The Nature Conservancy.

Vermont Center for Geographic Information, Inc.

58 South Main Street, Suite 2
Waterbury, VT 05676
Phone 802.882.3000 Fax 802.882.3001

The summary Table 1 below has been distilled from modeling output feature datasets resulting from the intersection of the VCLDB with all areas above 1500' and 2500'elevation, respectively.

Table 1: Land Area by Category above 1500' Elevation in Vermont	
Sector	**Acres**
Federal	383,426.7
Municipal	27,165.5
Other/Unknown	2,699.1
Private	226,501.3
Public	4,159.0
State	211,820.0
Total	855,771.6

Table 2: Land Area by Category above 2500' Elevation in Vermont	
Sector	**Acres**
Federal	97,832.8
Municipal	2,358.4
Other/Unknown	0.4
Private	18,519.8
Public	992.8
State	41,908.6
Total	161,612.9

METHODOLOGY

Project directory: G:\users\mikeb\outreach\VT1500ft; "1500ftclip" Model.

Areas at or above 1500' and 2500'elevation were iteratively extracted from the VGIS "ElevationDEM_DEM10M" digital elevation model and converted into a polygon shapefile for use in clipping the TNC 2012 data. Subsequently, these eight unique values were reassigned to a "Sector" field that contained six unique values as outlined below. Finally, a summary operation was done on the "SECTOR" field and

Vermont Center for Geographic Information, Inc.

58 South Main Street, Suite 2
Waterbury, VT 05676
Phone 802.882.3000 Fax 802.882.3001

aggregated acreage ("AreaAcres" field" by "SECTOR" to product the final output.

Table 2: Translation Table

FEE_ORGTYP	Desc	Sector
FED	Federal	Federal
LOC	Local	Municipal
PFP	Private for profit	Private
PLO	Private Land Owner	Private
PNP	Private Non Profit	Private
STP	State Park	State
TNC	The Nature Conservancy	Public
UNK	Unknown	Other/Unknown

ERRATA

- 15 records in the 2012 dataset had "unknown" values for the "FEE_OWNER" attribute used to assign the SECTOR categories. Eight records are New England Forestry Foundation Easements, two are Green Mountain Club Easements, one Dover Deer Meadow, one Gilman Housing Trust and three unnamed. Those areas above 1500' are reflected in the category "Other/Unknown".
- Final step to summarize sectors by acreage was done manually as no model option for this readily available.

QA/QC

A time consuming, full quality assurance/quality control effort was not conducted due to the unknown use of the data.

Conducted visual review of data in ArcMap using the following data:

1. EGC_services\MAP_VCGI_USTOPO_SP_CACHE;
2. GDB_VCGI.VCGI_ADMIN.BASEMAPOTHER_GMNFMAPS; and
3. *BASEMAPOTHER_GMNFMAPN USGS raster maps.

Vermont Center for Geographic Information, Inc.

58 South Main Street, Suite 2
Waterbury, VT 05676
Phone 802.882.3000 Fax 802.882.3001

APPENDIX A: PYTHON CODE

Only the code from scripts relating to the 1500' elevation are included below as they are identical to 2500' analysis except for elevation cutoff value used.

Script descriptions:

"**1_DEM10M_gt1500.py"** – Isolates all areas equal to or above 1500' (2500') elevation from the source raster, exports to output raster and then converts to polygon feature class for use in clipping VCLDB; and

"2_VLCDB_GT1500.py" – Uses output from script #1 to clip the VCLDB, then joins a table assigning the various sectors and finally recalculates the acres on clipped features.

```
# ---------------------------------------------------------------------------
# 1_DEM10M_gt1500.py
# Created on: 2014-07-22 13:53:13.00000
#   (generated by ArcGIS/ModelBuilder)
# Description:
# ---------------------------------------------------------------------------

# Import arcpy module
import arcpy

# Check out any necessary licenses
arcpy.CheckOutExtension("spatial")


# Local variables:
GDB_VCGI_VCGI_ADMIN_ELEVATIONDEM_DEM10M =
"GDB_VCGI.VCGI_ADMIN.ELEVATIONDEM_DEM10M"
Input_true_raster_or_constant_value = "1"
DEM10M_gt1500Value1 =
"G:\\users\\mikeb\\outreach\\VT2500ft\\GTEQ1500.gdb\\Data\\DEM10M_gt1500Value1"
DEM10M_gt1500Value1_Dissolve =
"G:\\users\\mikeb\\outreach\\VT2500ft\\GTEQ1500.gdb\\Data\\DEM10M_gt1500Value1_Dissolve"
DEM10M_gt1500Value1_Dissolve1 = "DEM10M_gt1500Value1_Dissolve1"
DEM10M_gt1500Value1_Dissolve1__2_ = "DEM10M_gt1500Value1_Dissolve1"
DEM10M_gt1500Value1_Dissolve1__3_ = "DEM10M_gt1500Value1_Dissolve1"
DEM10M_gt1500Value1_Dissolve1__4_ = "DEM10M_gt1500Value1_Dissolve1"
DEM10M_gt1500FNL =
"G:\\users\\mikeb\\outreach\\VT2500ft\\GTEQ1500.gdb\\Data\\DEM10M_gt1500FNL"
```

```
DEM10M1500CON_img = "G:\\users\\mikeb\\outreach\\VT2500ft\\DEM10M1500CON.img"
DEM10M1500CON_to_1_img = "G:\\users\\mikeb\\outreach\\VT2500ft\\DEM10M1500CON_to_1.img"

# Process: Con
arcpy.gp.Con_sa(GDB_VCGI_VCGI_ADMIN_ELEVATIONDEM_DEM10M,
GDB_VCGI_VCGI_ADMIN_ELEVATIONDEM_DEM10M, DEM10M1500CON_img, "", "Value >=1500")

# Process: Con (2)
arcpy.gp.Con_sa(DEM10M1500CON_img, Input_true_raster_or_constant_value,
DEM10M1500CON_to_1_img, "", "\"Value\" >= 1500")

# Process: Raster to Polygon (2)
arcpy.RasterToPolygon_conversion(DEM10M1500CON_to_1_img, DEM10M_gt1500Value1,
"NO_SIMPLIFY", "VALUE")

# Process: Dissolve
arcpy.Dissolve_management(DEM10M_gt1500Value1, DEM10M_gt1500Value1_Dissolve, "gridcode", "",
"SINGLE_PART", "DISSOLVE_LINES")

# Process: Make Feature Layer
arcpy.MakeFeatureLayer_management(DEM10M_gt1500Value1_Dissolve,
DEM10M_gt1500Value1_Dissolve1, "", "", "gridcode gridcode VISIBLE NONE")

# Process: Add Field (2)
arcpy.AddField_management(DEM10M_gt1500Value1_Dissolve1, "AreaSqMtrs", "DOUBLE", "10", "1", "",
"", "NULLABLE", "NON_REQUIRED", "")

# Process: Calculate Field (2)
arcpy.CalculateField_management(DEM10M_gt1500Value1_Dissolve1__2_, "AreaSqMtrs",
"!Shape.area@squaremeters!", "PYTHON_9.3", "")

# Process: Select Layer By Attribute
arcpy.SelectLayerByAttribute_management(DEM10M_gt1500Value1_Dissolve1__3_, "NEW_SELECTION",
"\"AreaSqMtrs\" > 200")

# Process: Copy Features
arcpy.CopyFeatures_management(DEM10M_gt1500Value1_Dissolve1__4_, DEM10M_gt1500FNL, "", "0",
"0", "0")
```

```
# ---------------------------------------------------------------------------
# 2_VLCDB_GT1500.py
# Created on: 2014-07-22 13:53:26.00000
#   (generated by ArcGIS/ModelBuilder)
# Description:
# ---------------------------------------------------------------------------

# Import arcpy module
import arcpy


# Local variables:
DEM10M_gt1500FNL =
"G:\\users\\mikeb\\outreach\\VT2500ft\\GTEQ1500.gdb\\Data\\DEM10M_gt1500FNL"
VLCDB_2012_TNC_External__2_ = "VLCDB_2012_TNC_External"
VLCDB_2012_TNC_FEE_ORGTYP_sum__2_ = "VLCDB_2012_TNC_FEE_ORGTYP_sum"
VLCDB1500clip = "G:\\users\\mikeb\\outreach\\VT2500ft\\GTEQ1500.gdb\\Data\\VLCDB1500clip"
VLCDB1500clip__2_ = "G:\\users\\mikeb\\outreach\\VT2500ft\\GTEQ1500.gdb\\Data\\VLCDB1500clip"
CONSPUB_2012_TNC_FEE_gt1500ft = "CONSPUB_2012_TNC_FEE_gt1500ft"
VLCDB1500clip__4_ = "G:\\users\\mikeb\\outreach\\VT2500ft\\GTEQ1500.gdb\\Data\\VLCDB1500clip"
CONSPUB_2012_TNC_FEE_gt1500ft__3_ = "CONSPUB_2012_TNC_FEE_gt1500ft"
VCLDB2012_AreaBySectorGT1500PreSummary_dbf =
"G:\\users\\mikeb\\outreach\\VT2500ft\\VCLDB2012_AreaBySectorGT1500PreSummary.dbf"

# Process: Clip
arcpy.Clip_analysis(VLCDB_2012_TNC_External__2_, DEM10M_gt1500FNL, VLCDB1500clip, "")

# Process: Add Field
arcpy.AddField_management(VLCDB1500clip, "AreaAcres", "DOUBLE", "10", "1", "", "", "NULLABLE",
"NON_REQUIRED", "")

# Process: Calculate Field
arcpy.CalculateField_management(VLCDB1500clip__4_, "AreaAcres", "!shape.area@acres!",
"PYTHON_9.3", "")

# Process: Make Table View
arcpy.MakeTableView_management(VLCDB1500clip__2_, CONSPUB_2012_TNC_FEE_gt1500ft, "", "",
"OBJECTID OBJECTID VISIBLE NONE;Shape Shape VISIBLE NONE;SUBREGION SUBREGION
HIDDEN NONE;STATE_PROV STATE_PROV HIDDEN NONE;AREA_NAME AREA_NAME VISIBLE
NONE;FEE_OWNER FEE_OWNER VISIBLE NONE;FEE_ORGTYP FEE_ORGTYP VISIBLE
```

NONE;INT_HOLDER INT_HOLDER HIDDEN NONE;INT_ORGTYP INT_ORGTYP HIDDEN NONE;INT_TYPE INT_TYPE HIDDEN NONE;TNC_INTRST TNC_INTRST HIDDEN NONE;ST_DESIG ST_DESIG HIDDEN NONE;DESIGNAT DESIGNAT HIDDEN NONE;IUCN_CAT IUCN_CAT HIDDEN NONE;GAP_ORIG GAP_ORIG HIDDEN NONE;GAP_TNC GAP_TNC HIDDEN NONE;GAP_STATUS GAP_STATUS HIDDEN NONE;CONS_INTNT CONS_INTNT HIDDEN NONE;CONS_TENUR CONS_TENUR HIDDEN NONE;EF_MGMT_POT EF_MGMT_POT HIDDEN NONE;CON_MGMT_ST CON_MGMT_ST HIDDEN NONE;DATE_CONSV DATE_CONSV HIDDEN NONE;DATE_PREC DATE_PREC HIDDEN NONE;LEGAL_ACRES LEGAL_ACRES HIDDEN NONE;GIS_ACRES GIS_ACRES HIDDEN NONE;CLS_MABRID CLS_MABRID HIDDEN NONE;CLS_TRACTID CLS_TRACTID HIDDEN NONE;CLS_TRACTNM CLS_TRACTNM HIDDEN NONE;REST_DATA REST_DATA HIDDEN NONE;MAX_MAP_SC MAX_MAP_SC HIDDEN NONE;REST_COMM REST_COMM HIDDEN NONE;SOURCE SOURCE HIDDEN NONE;CHG_GAP CHG_GAP HIDDEN NONE;CHG_ATTRIB CHG_ATTRIB HIDDEN NONE;CHG_GEOG CHG_GEOG HIDDEN NONE;COMMENTS COMMENTS HIDDEN NONE;WOMABR WOMABR HIDDEN NONE;WOTRACTID WOTRACTID HIDDEN NONE;WOTRACTNM WOTRACTNM HIDDEN NONE;WO_comments WO_comments HIDDEN NONE;IDState IDState HIDDEN NONE;D_AreaName D_AreaName VISIBLE NONE;D_Fee_Owner D_Fee_Owner VISIBLE NONE;D_Int_Holder D_Int_Holder VISIBLE NONE;Perimeter Perimeter HIDDEN NONE;Area Area HIDDEN NONE;Acres Acres VISIBLE NONE;Hectares Hectares HIDDEN NONE;Shape_Length Shape_Length HIDDEN NONE;Shape_Area Shape_Area HIDDEN NONE;Shape_length Shape_length HIDDEN NONE;Shape_area Shape_area HIDDEN NONE;AreaAcres AreaAcres VISIBLE NONE")

# Process: Join Field
arcpy.JoinField_management(CONSPUB_2012_TNC_FEE_gt1500ft, "FEE_ORGTYP", VLCDB_2012_TNC_FEE_ORGTYP_sum__2_, "FEE_ORGTYP", "FEE_ORGTYP;Cnt_FEE_ORGTYP;Fee_Desc;Fee_Category")

# Process: Copy Rows
arcpy.CopyRows_management(CONSPUB_2012_TNC_FEE_gt1500ft__3_, VCLDB2012_AreaBySectorGT1500PreSummary_dbf, "")