Forest Stewardship Spatial Analysis Project
Methodology Report for Colorado
December 2005

Stewardship FOREST

Colorado State FOREST SERVICE

FOREST SERVICE U S DEPARTMENT OF AGRICULTURE

Contact Info:

Jan Hackett
Stewardship Coordinator - Colorado State Forest Service
5060 Campus Delivery
Fort Collins, CO 80523-5060
Office: 970.491.7287
jhackett@lamar.colostate.edu

Jacob Frost
GIS technician - Colorado State Forest Service
Box 25046, MS 516
Denver Federal Center, Bld. 810
Denver, CO 80225-0046
office: 303.202.4339
frosty@lamar.colostate.edu

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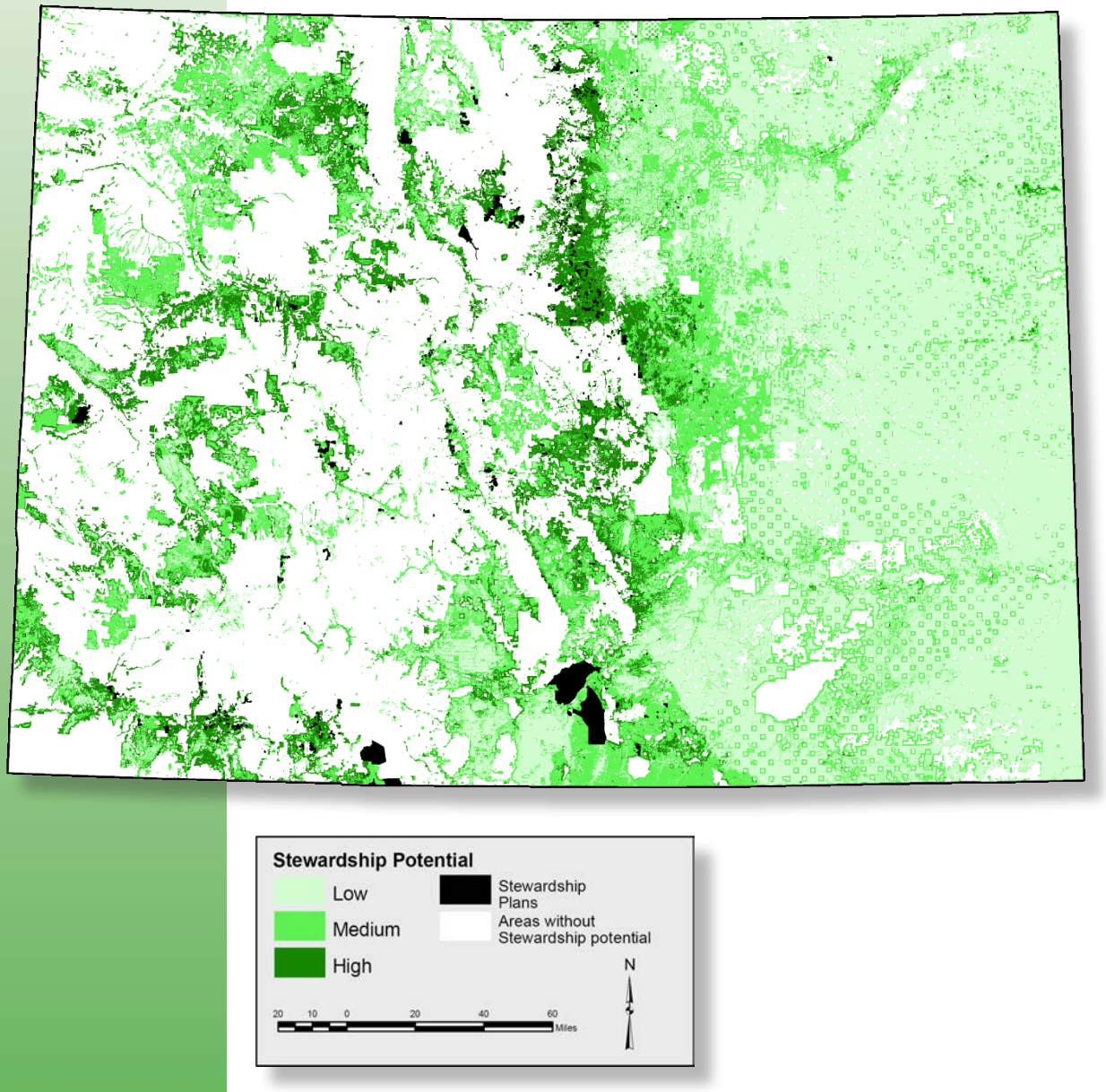


Colorado Spatial Analysis Project Results

Executive Summary:

The Forest Stewardship Program (FSP) Spatial Analysis Project (SAP) was developed to evaluate the impact over the landscape that the FSP has had over the last decade and identify areas of stewardship suitability to allow for strategic delivery of the FSP. The SAP has two main components: the historic spatial database of stewardship plan tracts, and the 12-layer suitability analysis. Both components are used together in a GIS analysis to categorize areas within a state according to the areas stewardship potential, and evaluate how effective the state has been at delivering the FSP in those priority areas.

The Colorado State Forest Service began the SAP process in June of 2004, and finished the project in January 2006. The majority of that time was committed to collecting the data for the stewardship plan database. All 17 CSFS districts were visited, and every stewardship plan evaluated, with the majority of them being digitized by hand into a geospatial database (ArcGIS personal geodatabase). In all, 872 stewardship plans were added to the database. There were 289 plans that were not added to the database because they could not readily be digitized (there was no topographic map to identify were the plan boundaries lay). Once the database was finished, work began on the suitability analysis. Completion of the analysis along with the map series and data analysis required approximately 2 months.

Analysis Results:

Stewardship Capable lands in Colorado:

- There are approximately 37.6 million acres of land in Colorado capable of being included in the Forest Stewardship Program
- Of those 37.6 million acres, approximately 9.6 million are forested
- Stewardship plan acres total 411,865 – or 1.1% of the total stewardship capable lands in Colorado.

Stewardship Potential in Colorado:

- Of the 37.6 million acres capable of stewardship, 15% is considered 'high' stewardship potential (based on 12-layer suitability analysis),
- 32% is considered 'medium' potential, and
- 53% is considered 'low' potential.

Discussion:

Stewardship potential is considered on all private lands, both forested and non-forested. With a high percentage of the forested lands in Colorado in public ownership, and a third of the state being non-forested, the total stewardship plan acres may seem low in comparison to the total area capable of stewardship. Looking at the analysis maps tells a different story. The vast majority of stewardship plans are in high and medium potential areas. This means the Colorado State Forest Service has done a good job of understanding where high priority stewardship areas are, and have focused program delivery in those high priority areas.

Stewardship Analysis Project (SAP) Introduction[1]

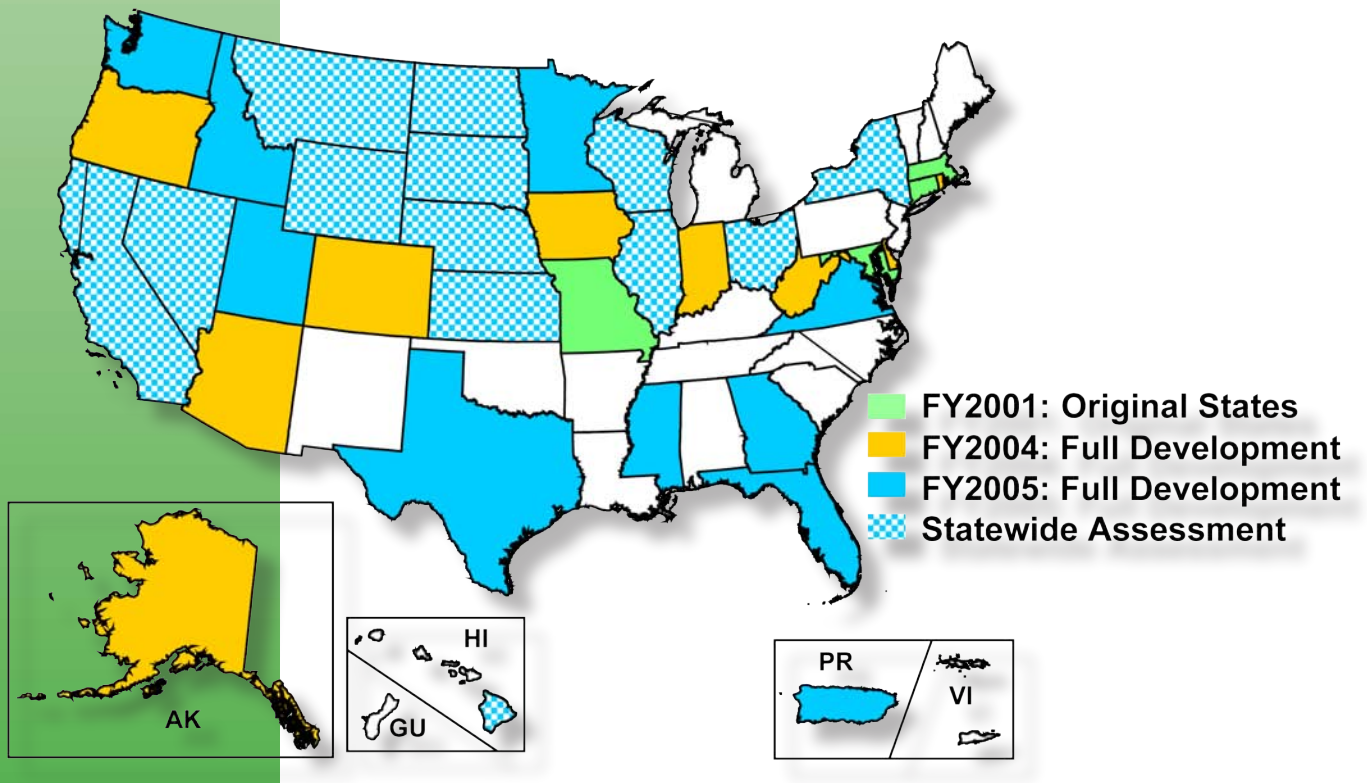
Forest Stewardship Program:

Established through the 1990 Farm Bill, the Forest Stewardship Program (FSP) encourages private forest landowners to manage their lands using professionally prepared forest stewardship plans. These plans consider and integrate forest resources, including timber, wildlife and fish, water, aesthetics, and all associated resources to meet landowner objectives. Nationally, the FSP has been successful in meeting the intent of the program; more than 25 million acres of private forests have been placed under professional forestry management.

SAP Purpose and Background:

Since its inception, the FSP has been delivered and made available to nonindustrial private forest landowners on a first-come, first-served basis. This customer-friendly approach assists landowners in improving their forest resources; however, it fails to allow assessment of the program's full impact across the landscape. It does not take into consideration the connectivity of stewardship tracts, nor does it target landowners whose forest land has a greater need or opportunity for professional expertise and who may not have been aware of resources and programs available to them. There has been no standard or consistent way to assess the impact that stewardship plans have had on the forest resource as a whole, or in addressing regionally or nationally significant resource issues. Given limited program resources and a demand that exceeds program capacity, FSP coordinators and managers increasingly need to address accountability for results on the ground, assuring the Nation's taxpayers that program implementation is efficient and effective, and positively affects forest resources.

1 Text taken from other national SAP documents (see Appendix E)



National SAP Status 6/2005

After over a decade of implementation, it is timely to evaluate the impact the Forest Stewardship Program has had on the landscape and position the program to be strategically implemented to more effectively address critical resource management needs in the future, while meeting landowner objectives.

In FY2001, the Northeastern Area and Connecticut, Maryland, Massachusetts, and Missouri began a pilot Forest Stewardship Program Spatial Analysis Project. The purpose of the pilot was to create a better way to assess the impact of the Stewardship program to date, and to strategically implement the program to more effectively address critical resource management needs in the future.

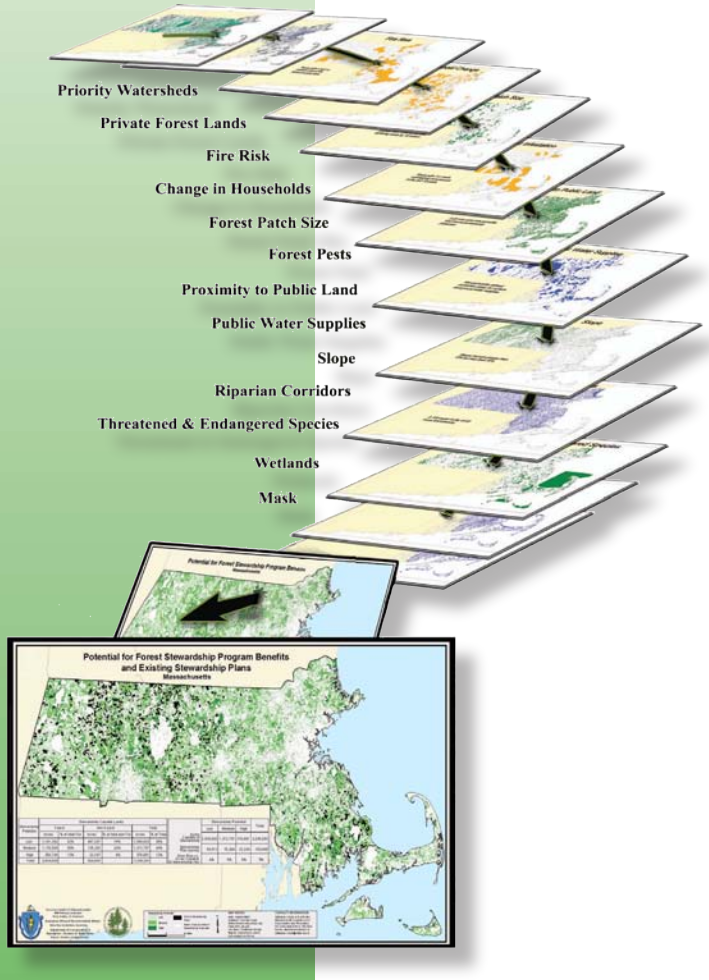
SAP Implementation

The FSP Spatial Analysis Project is comprised of two major components. First is the stewardship suitability analysis. Using the 12 common datalayers (discussed later) developed by the four pilot states, and any other state specific layer of importance, an overlay analysis is conducted. The results of this overlay are then classified into regions of low, medium and high stewardship potential. Once the overlay is finished, it is compared to the second component of the SAP; the historic database of stewardship plans. The plan tract boundaries are digitized into a geodatabase along with relevant attribute information. These digitized plans are combined with the suitability analysis to determine how effective the stewardship program has been based on location of plans and the percentage of plans within each high, medium, and low stewardship potential category. The two components are then used to identify areas of need and opportunity. Strategic delivery of the Forest Stewardship Program is accomplished through pursuing stewardship opportunities of high priority.

Colorado officially beagn the Spatial Analysis Project in June of 2004. Once all of the background information, grant procedures, and hiring was completed, the actual process of collecting the data started in February 2005 and the project was completed in December of 2005.

Part 1. Suitability Analysis

One half of the SAP is the state-wide stewardship suitability analysis. It is comprised of 12 common datalayers, an analysis mask, plus any other state-specific layers deemed important to that particular state. For Colorado, a layer was added to capture the resource potential within non-forested, non-agricultural lands. The layers are divided into four categories: analysis mask, resource potential, resource threat, and optional layers. For a full discussion on the choosing and development of the 12 common datalayers, please see Appendix E (Data Layer Purpose and Outcome).



Overlay Analysis Process

Other Data:

1. Analysis Mask – defines areas for the analysis to take place

Resource Potential:

2. Riparian Corridors – river layer buffered by 300' (or Best Management Practice designation)
3. Priority Watersheds – EPA's percent of impaired waters (or state defined)
4. Forest Patch Size – National Land Cover Data layer values minus road networks
5. Threatened and Endangered Species – T&E species information from state Natural Heritage Program
6. Public Water Drinking Supply Sources – determined by states
7. Private Forest Lands – NLCD forested values on private land
8. Proximity to Public Lands – public and protected lands buffered by 800 meters (~1/2 mile)
9. Wetlands – forested wetlands from GAP vegetation data (or state defined)
10. Topographic Slope

Resource Threats:

11. Forest Health – major insect and disease threats using USFS aerial survey data
12. Developing Areas – census block data
13. Wildfire Assessment – areas of high risk to wildfire (Colorado 2001 WUI assessment)

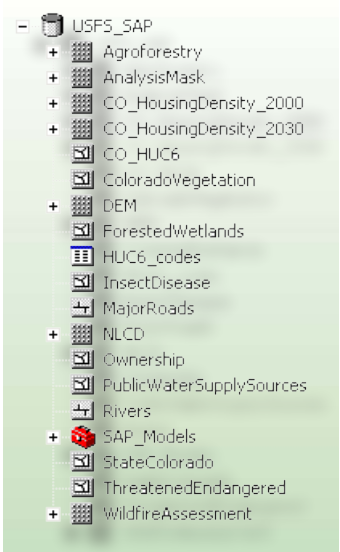
Optional Layer for Colorado:

14. Agroforestry Suitability – areas of agroforestry potential in Colorado

The layers are created as a raster or converted from a vector data type for a faster geoprocessing time and then reclassified to a common scale. Scale values range from zero to one where a 1 indicates the presence of that layer, and a 0 is negative for the presence of that layer. Each layer is weighted and added together (the overlay) to reveal areas of high, medium, and low stewardship suitability. This overlay analysis allows for strategic stewardship program delivery (as opposed to first come, first served method) as well as a spatial means of work planning and prioritizing. The process of developing the individual datalayers for Colorado is described below.

Datalayer Development:

To organize the layers for the analysis, Colorado developed a personal geodatabase containing all of the analysis layers. A custom toolbox was added to the geodatabase that contained the models for analysis. All of the analysis elements are then created within the folder containing that geodatabase. Organizing the data in this manner allows for easy sharing of the data, since all of the analysis, map documents, and workspace are contained within one folder. Consult appendix A to view the models and specific tools used to derive each layer. Metadata was produced for the final 13 layers used in the suitability analysis, the resource richness and resource threats layers, and the stewardship potential layer using FGDC standards.



SAP Personal Geodatatbase

Other Data:

1. Analysis Mask

The analysis mask identifies those cells within the analysis extent that will be considered when performing an operation or a function. Setting an analysis mask means that processing will only occur on selected locations and that all other locations will be assigned values of NoData (ESRI ArcGIS Help). For the purpose of the SAP analysis, the mask includes all areas that are *not* urban/developed areas, public ownership, and open water. The mask was created by combining a grid of NLCD (online source: http://www.epa.gov/mrlc/nlcd.html) suitable areas and a grid of privately owned lands. The NLCD values of 11, 12, 21, 22, 23, 31, and 32 (see Appendix B for NLCD definitions) received a NoData value and the remaining NLCD values received and a 1. Private lands in the grid receive a value of 1. When the rasters are combined using the Weighted Overlay tool, the mask is produced. The Anlaysis Mask layer is used as several of the environment settings, so this layer will be the first to be modeled and run. This saves some process steps in the analysis.

Resource Potential:

1. Riparian Corridors - The riparian zone dataset is created by buffering the Rivers feature class (ESRI dataset; 1:24,000 scale) by 300'. Final grid name = rc_river_buff

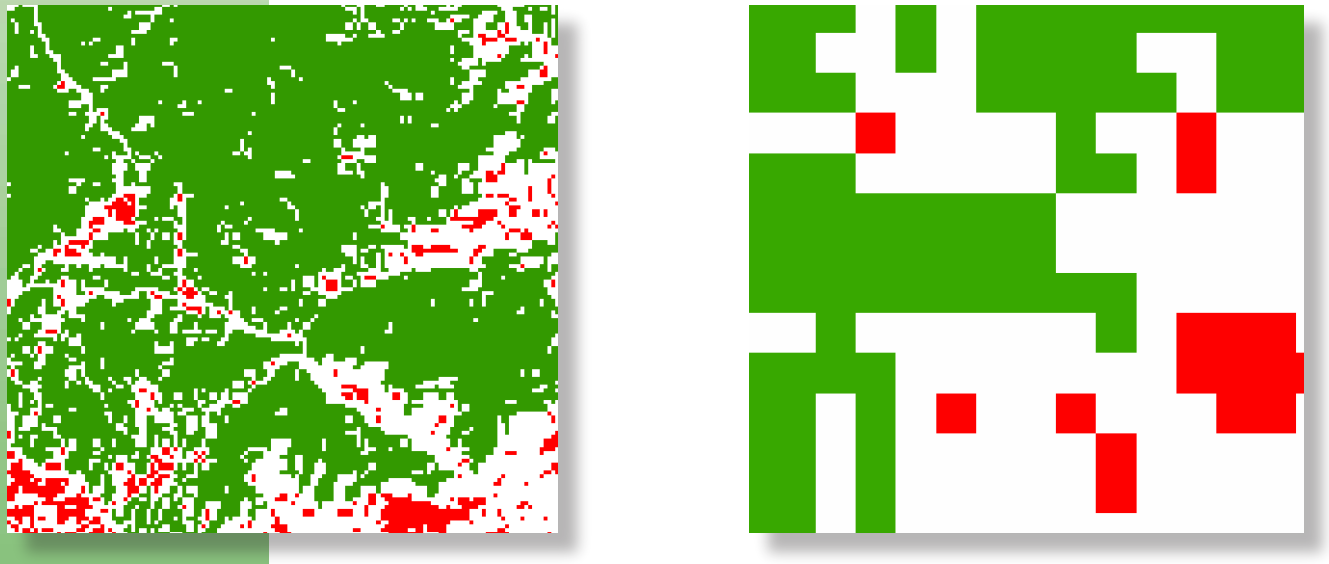
2. Priority Watersheds – Priority Watersheds in Colorado were determined using the 2002 Percent of Impaired Waters data produced by the EPA (Online Source: http://www.epa.gov/waters/data/downloads.html). Sixth level hydrological units were classified based on a scale developed by the EPA to signify the percentage of waters impaired in each hydrologic unit. The shapefile was then converted to raster and reclassified to a 1,0 scale. Hydrologic units with any percentage of impaired waters received a 1, while those units without any impairment received a 0. Final grid name= rcpriority_ws

3. Threatened and Endangered Species – Threatened and endangered species information was collected from the Colorado Natural Heritage Program (online source: http://www.cnhp.colostate.edu/gis.html). This data was converted to a grid with occurrence areas rating as a 1 and other areas as 0. Final grid name = rc_tande

4. Forest Patch Size – The goal of the forest patch size dataset is to determine a minimum patch size for the state and emphasize management of these forested areas. For Colorado, large continuous patches of forest generally create high wildfire hazard. Management activities are focused on reducing hazardous fuels and promoting a healthy forest. To create the dataset, larger contiguous patches of forest need to be isolated and patches below the size threshold need to be removed. The patch size for analysis

was set at 1,000 acres or 4,046,862 m^2 (square map units). For this analysis, 1,000 acres seemed an appropriate size to complement the state-wide scale of analysis, and allowed for faster geoprocessing times. Forested values in the NLCD dataset are selected (41,42,43,51,91), then a buffered (100ft.) road layer is subtracted from the forested areas to create a layer of forest patches. The patches are classified by size using the Region Group and the Zonal Geometry tool. Patches over 1,000 acres are extracted using the Extract by Attributes tool.

While a model was built to run each process, the actual process took place using ArcMap and the Saptial Analyst toolbar because of a bug in Model Builder not honoring the Environment Settings of the analysis. There were problems using the buffered road layer as well. Because of the 100 meter cell size used in the analysis, the road layer became fragmented and as a result, would not 'punch through' the forested layer. This created invalid areas of forest. To overcome this problem, a 25 meter cell size was used to create the road raster. Then the road grid was expanded one cell to fill in the roads, allowing them to fully punch through the forested areas and removing the invalid forest areas. Admittedly, this increased the road buffer by an amount of 25 meters. Final grid name = rc_ac_patch



Stands >1000 acres are green <1000 acres are red. The right hand image shows that the Region Group operation only includes contiguous cells.

5. Public Water Drinking Supply Sources – Created by the Colorado Department of Health by looking at areas of watersheds that drain into water intake points. This data was then converted to a grid and reclassified so that land within source areas receive a value of 1 and other areas receive a 0 value. The public water drinking supply source datalayer is a restricted dataset, and will not be distributed with the SAP deliverables. Final grid name = rc_pub_water

6. Private Forested Lands – Created by selecting the values of 41, 42, 43, 51, and 91 from NLCD data. Since the model has the analysis mask set in the Analysis Properties the resulting grid is only created in areas of Stewardship Suitability. This saves a step in the analysis. Final grid name = nlcd_forested

7. Proximity to Public Lands – An 800 meter (~1/2 mile) buffer of public lands was created to locate private lands in proximity to public lands. Using a Colorado ownership dataset produced by Dr. David Theobald of Colorado State University (see metadata for citation information), all lands were selected that were *not* public with the following expression: [OWNER] <> 'Private'. For each tool in this step the analysis extent must be set to the entire analysis area (over-ride the analysis mask in the model settings) or this will not work. Final grid name = rcpub_land_ex

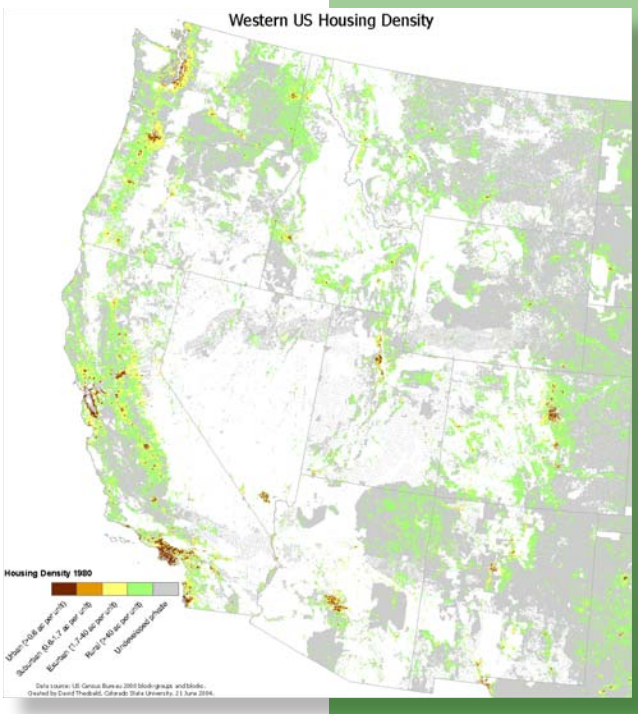
8. Wetlands – The data for forested wetlands came from state GAP vegetation information (online source: http://ndis1.nrel.colostate.edu/cogap/). The code 61001 was chosen from the PRIMARY field. The resulting vector layer was then converted to a raster. Final grid name = rc_for_wet

9. Topographic Slope – A DEM of Colorado (online source: http://ned.usgs.gov) was used to create the percent slope layer in the analysis. This grid was then reclassified to a value of 1 for slope between 0-50% and 0 for all other values. The slope classification is the range of operability (for mechanical harvesting) in Colorado. Final grid name = rc_per_slope

Resource Threat:

10. Forest Health – Bark beetle epidemics are the largest insect and disease threat to Colorado's forests. Using the USFS Forest Health Aerial Survey information (online source: ftp://ftp2.fs.fed.us/incoming/r2/ro/aerial_survey/), DCA1 codes of 11000, 11002, 11006, 11007, 11009, 11029, 11030, and 80004 were selected to isolate areas of bark beetle (prominent Dendroctonus and Ips species) activity. This information was then converted to a grid. Final grid name= rc_barkbeetle

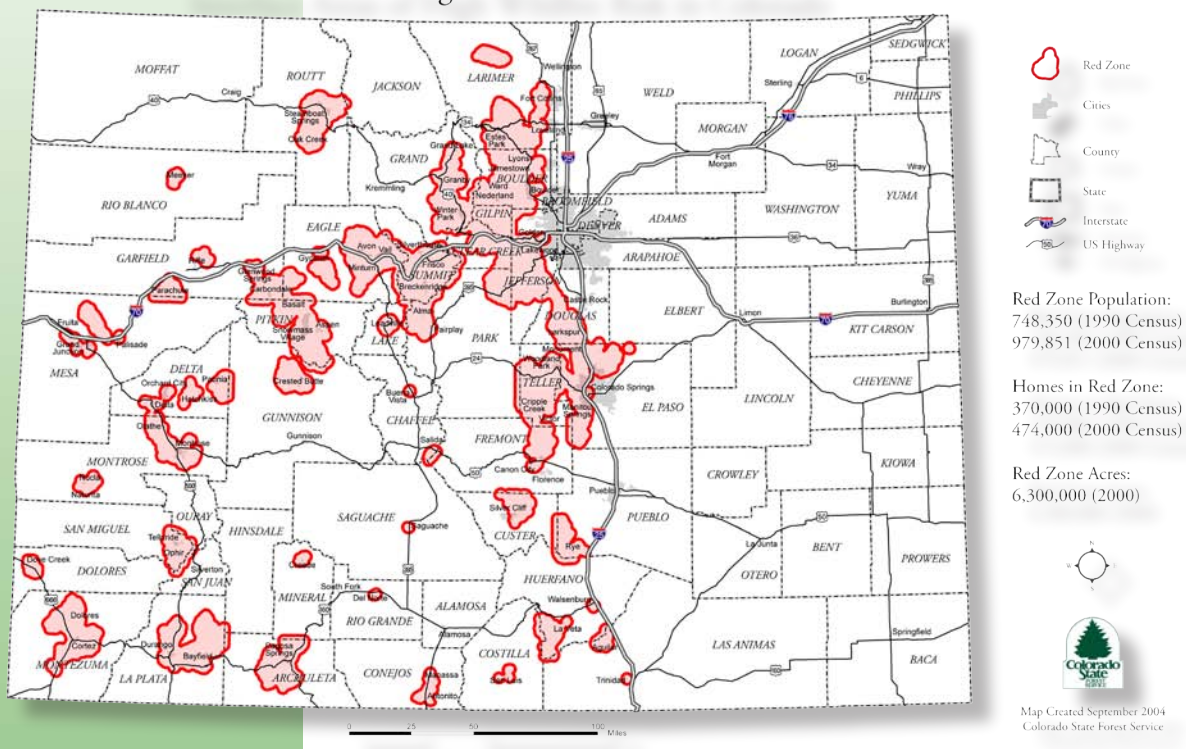
11. Developing Areas – Dr. David Theobald produced the housing density layer used for the Colorado SAP analysis (see metedata for citation information). The data is an updated version (v4) of the housing density data produced from his Forests on the Edge study. The data was produced from subtracting public lands and water areas from 2000 Census block data then calculating acres per house. Housing density was projected forward using current development trends. For the SAP analysis, 2030 density projections were subtracted from the 2000 density to determine areas under pressure from development. Lastly, the raster was reclassified so developing areas return a value of 1 while other areas return a 0 value. The datalayer was produced within ArcMap rather than Model Builder to speed up processing times (due to a bug in Model Builder not recognizing the analysis extent and subtracting density values for the whole country instead of just Colorado). Final grid name = rc_house_den



Western US Housing Density - Dr. David Theobald

12. Wildfire Assessment – The wildfire assessment layer was created by reclassifying the 2001 Wildland Urban Interface Hazard Assessment for Colorado. The values for the assessment ranged from 2-14 with values 10-14 being selected as the high values. Values 10-14 were reclassified to a value of 1 with other values being changed to 0. Final grid name = high_wf_haz

Interface Areas of High Wildfire Risk in Colorado



Wildfire risk and Colorado

Optional Layer for Colorado:

13. Agroforestry Suitability – Created by adding NLCD values of 51,71, and 91 with all elevations under 10,000ft (from a 30 meter DEM) using the Weighted Overlay tool. These are areas in Colorado that can sustain agroforestry work. Final grid name = rc_agorforest

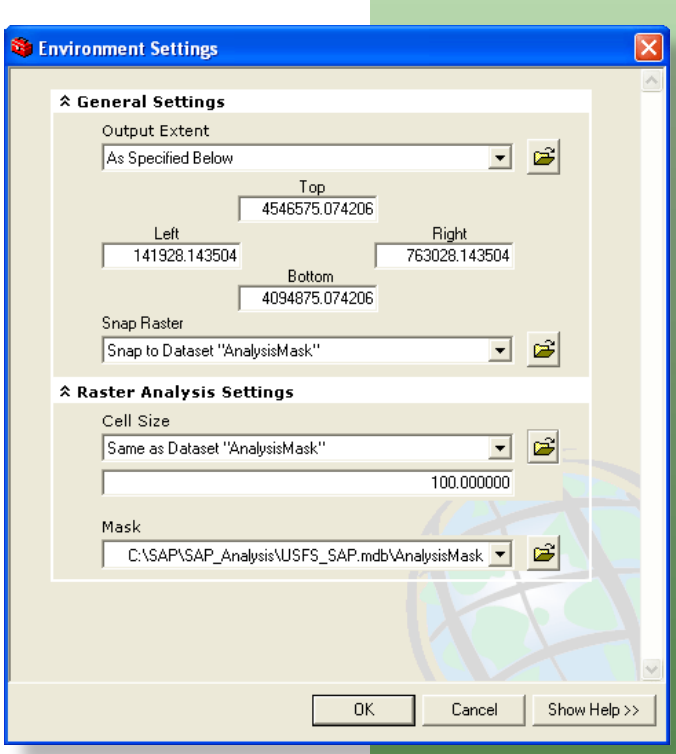
Model Builder:

Colorado used the ArcGIS Model Builder to model and run each of the analysis steps. Four models were created, the first for the Analysis Mask, the second for the forest patch layer, the third for the optional agroforestry layer, and the fourth to run the suitability analysis. Even though every process was modeled using model builder, some geoprocessing still occured in ArcMap due to some irregularities with Model Builder processing. All of Colorado's models are in Appendix (A).

For the SAP models certain analysis properties will need to be set. The Anlaysis Mask layer is used as several of the environment settings, so this layer will be the first to be modeled and run.

Under Model, select Model Properties and the analysis properties will be displayed for the current model. Select the check boxes for Output Extent under General Settings and check Cell Size and Mask under Raster Analysis Settings. Click on the Values Button and the Environment Settings box will appear. In this box set the Output Extent to the state or region being modeled. Set the Raster Analysis Settings to Same as Dataset "Analysis Mask" created by combining a grid of NLCD suitable areas and a grid of privately owned lands and set the Mask same datalayer. Using this mask will force the analysis to occur in suitable areas only. This saves some process steps in the analysis.

Set the output extent, snap raster, cell size, and mask to the Analysis Mask previously created to ensure that all datalyers line up with each other. This will eliminate any cell overlap. In this screen shot, the Output Extent is set to Colorado's Analysis Mask, but when a snap raster is chosen, the output extent defaults back to the 'As Specified Below' option (although the actual extent remains the same).



Environment settings in Model Builder

Datalayer Weighting Process:

Not all layers within the analysis are equally important to forest stewardship suitability. Each has a varied degree of influence determined by local resource issues. In Colorado, the threat of wildfire has become the resource issue of highest importance. Conversely, riparian corridors are not as influencial when determining stewardship suitability in Colorado. To account for the variance of influence, all data layers were weighted. In effect, the weighting skews the suitability analysis in favor of layers with greater importance. For the sake of simplicity, Colorado chose to assign different influence percentages to each layer. This percent influence was determined from both the strategic priorities of the agency and resource issues of current importance such as wildfire or the recent bark beetle epidemics.

Once the percent influence for each layer was determined, the layers were multiplied by their corresponding percent influence, then added together. In the final analysis, this returned values between 0 and 1, with values closer to 1 having a higher stewardship potential.

Datalayer Weights:

Wildfire Hazard: 15% (0.15)
Private Forested: 12% (0.12)
Insect & Disease: 12% (0.12)
Public Drinking Water Sources: 12% (0.12)
Change in Housing Density: 10% (0.12)
Proximity to Public Lands: 8% (0.08)
Agroforestry: 6% (0.06)
T & E Species: 6% (0.06)
Forest Patch Size: 5% (0.06)
Slope: 5% (0.05)
Forested Wetlands: 3% (0.03)
Priority Watersheds: 3% (0.03)
River Riparian Areas: 3% (0.03)

Results:

Actual analysis values were between 0 (201 cells out of a possible 28,055,087 cells) and 0.97 (7 cells). The 0.97 high value indicates there was no cell that 'hit' all layers, while there were a few cells that hit none of the layers. After the analysis was run, the low, medium, and high classes were determined using the Natural Breaks classification algorithm. Class values were defined as follows:

Low:	0-0.20
Medium:	0.21-0.38
High:	0.39-0.97

The analysis grid was then reclassified to an integer grid with values of 1, 2, and 3, to represent areas of low, medium, and high stewardship potential, respectively.

Stewardship Potential	Stewardship Capable Lands					
	Forest		Non-Forest		*Total*	
	Acres	% of total For.	Acres	% of total non-For.	Acres	*% of Total*
High	4,720,447	49%	858,443	3%	5,578,890	*15%*
Medium	4,784,200	50%	7,386,710	26%	12,170,910	*32%*
Low	89,081	1%	19,820,786	71%	19,909,867	*53%*
Total:	*9,593,728*		*28,065,939*		*37,659,667*	

Table from Analysis Map #2 showing the Stewardship Capable Lands in Colorado

	Stewardship Potential			*Total:*
	Low	Medium	High	
Acres Capable of Stewardship:	19,909,867	12,170,910	5,578,890	37,659,667
Stewardship Plan (acres):	41,902	216,733	153,230	411,865
Stew.Plan vs. Acres Capable of Stewardship (%):	0.2%	1.8%	2.7%	1.1%

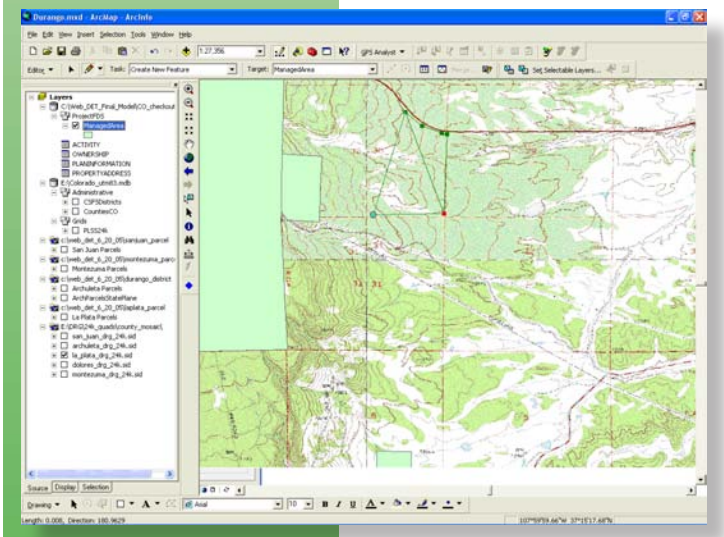
Table from Analysis Map #2 showing the Stewardship Potential acres in Colorado

2. Stewardship Plan Digitizing

The other main component of the Spatial Analysis Project is the collection and digitizing of stewardship plans for use in the suitability analysis. For Colorado, this process proved to be the most time-consuming since all records were created from scratch. In Colorado, stewardship plan information is not centrally located. Each of the 17 CSFS distrcits was visited to collect the necessary information. Collecting the information from each district was time consuming because every district had a different method of filing and organizing plan information. Another hurdle faced in data collection was inadequate plan information. On plans created at the beginning of the stewarship program maps were sometimes not included in the report. Because of this, the plan was not able to be digitized into the geodatabase used to store the SAP data. Overall, there were 289 plans that did not make the SAP database due to a lack of topographic map (or any other way to digitize the plan boundary).

Procedures:

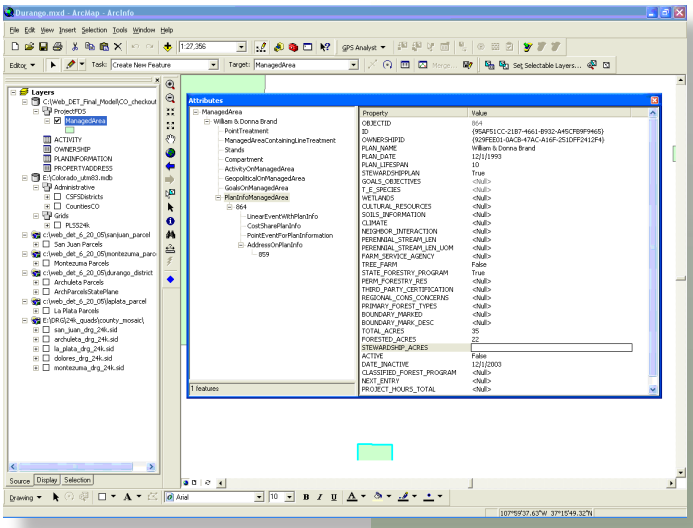
The first step in digitizing stewardship plans for the SAP was to determine how they would be stored. Colorado decided to store the data in the personal geodatabase designed for the Web-DET application (see Appendix C). Before the Web-DET geodatabase was designed, other states stored the plan boundaries in a shapefile while the attribute information resided in an Access database. Once the geodatabase was designed, stewardship plan boundaries were either heads-up digitized from the stewardship plan topographic map and a corresponding topographic DRG layer into the Managed Area feature class of the geodatabase, or they were copied from existing county parcel data and pasted into the geodatabase. Once the plan boundary was digitized, specific plan information was entered manually into the geodatabase attribute tables using the Attribute Editor in ArcMap. The PLANINFORMATION, PROPERTYADDRESS, OWNERSHIP, and ACTIVITY tables in the geodatabase were populated from written plan information.



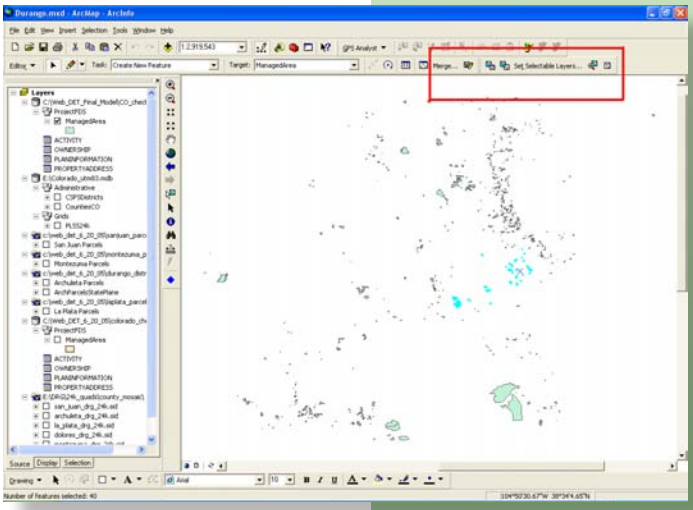
Heads-up digitizing a stewardship plan boundary

To speed up data entry, a custom toolbar was created which contains commands to easily access repeated processes. Creating this toolbar takes only minutes, and the efficiency gained over almost 900 stewardship plans was significant.

If stewardship data is already digitally maintained, there are procedures developed to migrate that data into the Web-DET geodatabase without starting from scratch. These procedures describe a process of merging stewardship data from the old SAP Access database and corresponding shapefiles or previous Web-DET geodatabase versions into the current Web-DET geodatabase. See Appendix D for complete instructions on data migration.



Using the Attribute Editor to enter plan information.



These commands were added to the map document to increase efficiency

Metadata:

Metadata was produced for the Managed Area feature class and the geodatabase attribute tables using the FGDC metadata editor in ArcCatalog. Metadata was produced to Federal Geographic Data Committee (FGDC) standards.

Analysis & Map Products:

Completion of the Spatial Analysis Project requires the intial suitability analysis plus a series of seven maps each requiring their own analysis and statistics. As mentioned above, the analysis was completed in a grid environment. Colorado chose to run the analysis with a 100 meter cell size for each grid. This significantly reduced geoprocessing times. The 100 meter cell size was also chosen to match the resolution of most datasets used in the analysis. At approximately 2.5 acres, the 100 meter cell size is also suitable for a more local analysis (as opposed to state-wide).

Each map and analysis will be discussed individually below.

Map notes: Colorado changed the Analysis Mask legend item from: Analysis Mask to: Areas Without Stewardship Potential to more accurately reflect the areas without stewardship potential (since the mask identifies areas in which analysis *occurs*). This change is refelected in each map. Once the maps were finished, they were exported as a .pdf file for easier viewing, printing, and distribution (When exporting from ArcMap, make sure the 'embed all fonts' option is checked).

Map #1: *Potential for Forest Stewardship Program Beneifits*

Map #1 displayed the state-wide suitability analysis. Accompanying the map is a table comparing each level of satewardship potential with total stewardship capable lands. This table was created using the Tabulate Area tool. The analysis mask defined the zones, while the stewardship potential grid defined each value (low, medium, high). In every map in which the Tabulate Area tool is used, the created .dbf table is opened in Microsoft Excel for calculations. Values are summed and then converted to acres (from square meters). The table is then saved as an Excel worksheet.

Map #2: *Potential for Forest Stewardship Program Benefits and Existing Stewardship Plans*

Existing stewardship plans are overlayed with stewardship potential in this map. Another table is created, comparing stewardship plan acres to total acres capable of stewardship. These numbers are derived using the Tabulate Area tool. For this map, stewardship plans define the zone, while stewardship potential defines the values. For this tool to work properly, the Managed Area feature class containing the stewardship plans had to be exported as a shapefile, and the shapefile used to define the zones. It is still unclear if this is a bug at 9.0, or a problem with the particular computer used.

Map #3: *Forest Stewardship Potential on Private Forest Lands and Existing Stewardship Plans*

Map #3 looks at stewardship potential only on private forest land. To create the private forest land layer, NLCD forested values (41, 42, 43, 51, 61, 91) are combined with a private land ownership layer. Once this layer (private land plus forested values) is created, it is added to the stewardship potential layer with the resulting dataset of stewardship potential on only private forest lands. The Anlaysis Mask legend item is changed to: *Non-Forest* to more accurately represent the white areas of the map. The Non-Forest, Non-Developed legend item was changed to: All-Forests to show areas of all forests in Colorado compared to private forest land. The table in map #3 of stewardship poten-

tial on private lands was created with the Tabulate Area tool. The private forest dataset defined the zones, while steardship potential defines the values.

Map #4: *Resource Richness*

The resource richness map displays an aggregate of selected resource potential data themes. Colorado added the agroforestry layer as well as the T & E species layer. In adding these (resource potential) data themes together, Colorado kept the relative weights assigned in the suitability analysis. The data was then normalized to match the 0 to 1 scale used in the suitability analysis.

Map #5: *Resource Threats*

The resource threats map is the opposite of the resource richness map. All three resource threats data themes from the suitability analysis are used to derive the resource threats map. Again, Colorado kept the relative weights of each layer then extrapolated them to normalize the data. Doing so maintains the same scale used in the suitability analysis.

Map #6: *Forest Stewardship Program Potential on Non-Forested – Non-Developed Lands and Existing Stewardship Plans*

Map #6 displays forest stewardship potential on all stewardship capable lands that is not reflected in the private forest map (map #3). The non-forest – non-developed (nfnd) grid is combined by selecting the appropriate NLCD values, and adding them to the stewardship potential grid. The Tabulate Area tool was then used to produce the nfnd stewardship potential table. The nfnd layer defines the zones, and the stewardship potential layer defines the values.

Map #7: *Forest Stewardship Potential on Private vs. Non-Forest and Existing Stewardship Plans for the Denver Area*

Colorado's regional map juxtaposes forested and non-forested stewardship potential. The forested stewardship potential retains the green color scale while the non-forested areas receive an orange color scale. A map scale of 1:200,000 was chosen for the map. This scale shows stewardship potential in detail for the Denver area. Other data layers such as roads, rivers, lakes, and municipal areas are then added to the map to better place stewardship potential. Production of more regional and area maps by Colorado State Forest Service will prove to be beneficial in work planning and prioritizing.

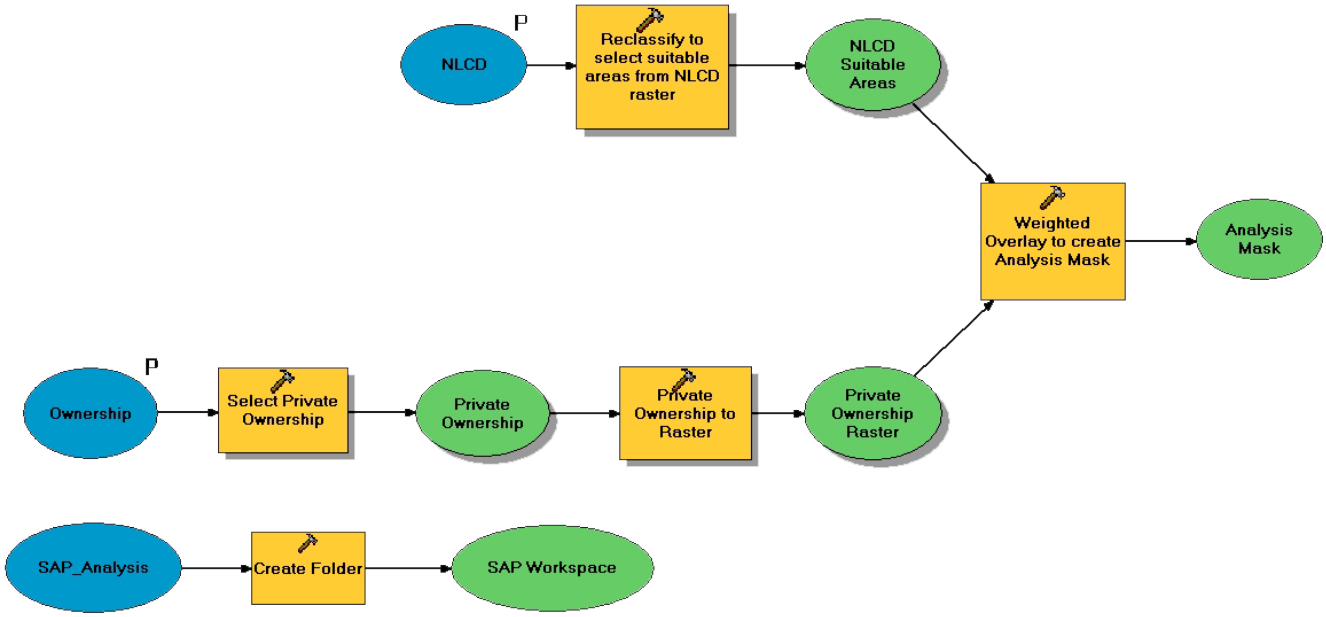
Update Cycle and Future Uses of the Data

For continuing effectiveness in FSP strategic delivery, both components of the SAP should be updated. Using Web-DET will ensure the stewrdship plan database will be continually current. The stewrdship potential dataset will be updated as new, improved data becomes available, or as angency priorities and resource issues change.

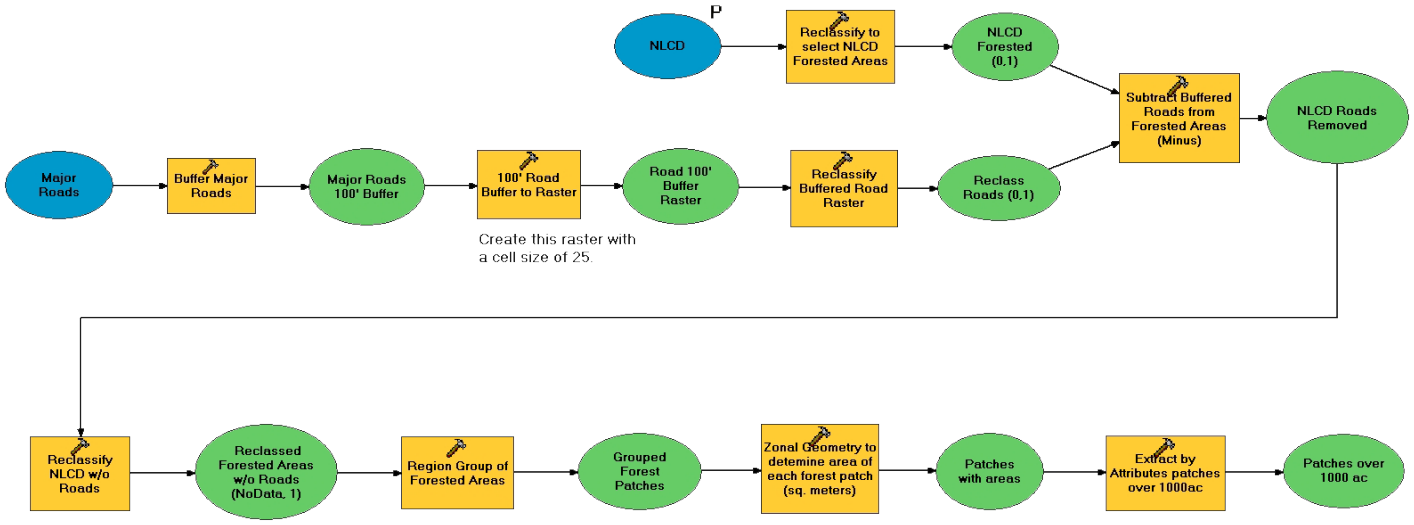
The usefuleness of SAP data goes beyond that of stewardship planning. By weighting the layers according to resource issues and agency priorities, the data provides important areas of focus for many CSFS programs. Combinging both stewardship plan location and stewardship potential with maps of other activities such as fuel reduction or forest restoration projects will help maximize total CSFS effectiveness in providing stewardship to Colorado's forest resources.

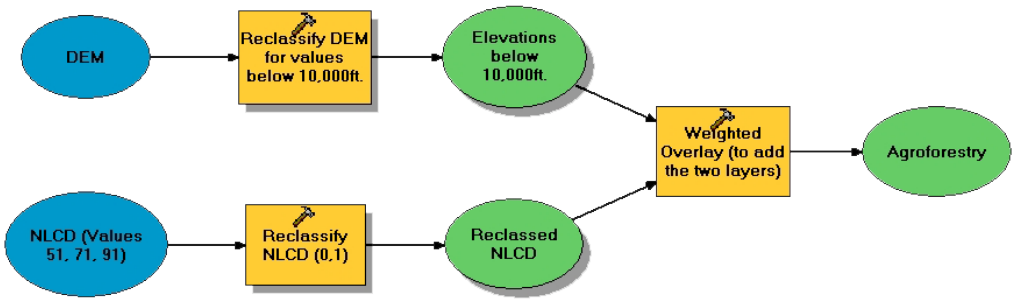
Appendix A: Model Builder Models

This step creates the workspace folder, analysis mask and data elements for use in future models

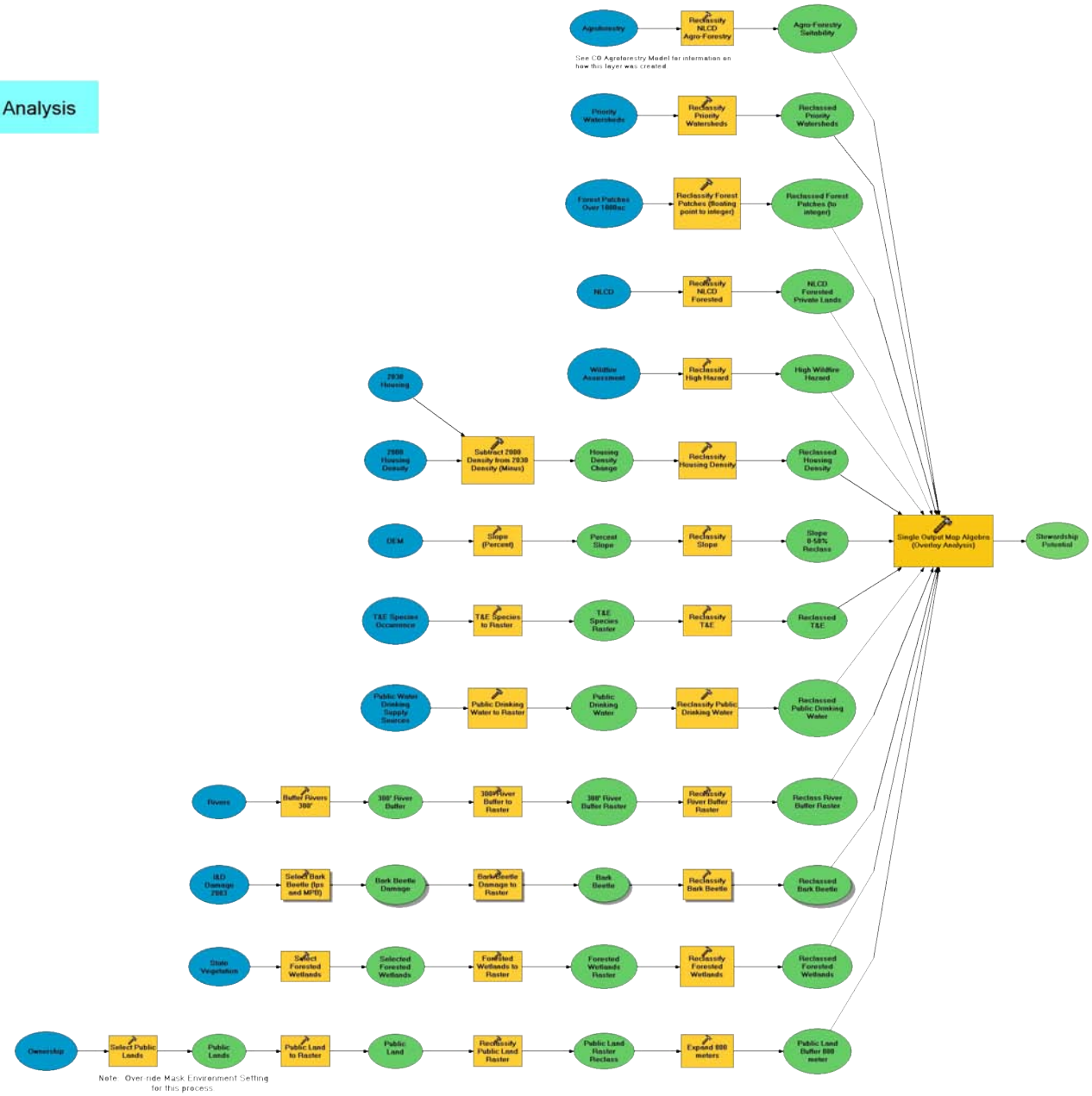


This step creates the Forest Patch Size Data layer to be used in the Overlay Analysis





The Overlay Analysis



Appendix B: National Landcover Datalayer Definitions

http://www.epa.gov/mrlc/definitions.html

U.S. Environmental Protection Agency

Multi-Resolution Land Characteristics Consortium

Definitions

NLCD (National Land Cover Datalayer)

1992 Classification System

10. Water - All areas of open water or permanent ice/snow cover.

11. Open Water - all areas of open water, generally with less than 25% cover of vegetation/land cover.

12. Perennial Ice/Snow - all areas characterized by year-long surface cover of ice and/or snow.

20. Developed - Areas characterized by a high percentage (30 percent or greater) of constructed materials (e.g. asphalt, concrete, buildings, etc).

21. Low Intensity Residential - Includes areas with a mixture of constructed materials and vegetation. Constructed materials account for 30-80 percent of the cover. Vegetation may account for 20 to 70 percent of the cover. These areas most commonly include single-family housing units. Population densities will be lower than in high intensity residential areas.

22. High Intensity Residential - Includes highly developed areas where people reside in high numbers. Examples include apartment complexes and row houses. Vegetation accounts for less than 20 percent of the cover. Constructed materials account for 80 to100 percent of the cover.

23. Commercial/Industrial/Transportation - Includes infrastructure (e.g. roads, railroads, etc.) and all highly developed areas not classified as High Intensity Residential.

30. Barren - Areas characterized by bare rock, gravel, sand, silt, clay, or other earthen material, with little or no "green" vegetation present regardless of its inherent ability to support life. Vegetation, if present, is more widely spaced and scrubby than that in the "green" vegetated categories; lichen cover may be extensive.

31. Bare Rock/Sand/Clay - Perennially barren areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, beaches, and other accumulations of earthen material.

32. Quarries/Strip Mines/Gravel Pits - Areas of extractive mining activities with significant surface expression.

33. Transitional - Areas of sparse vegetative cover (less than 25 percent of cover) that are dynamically changing from one land cover to another, often because of land use activities. Examples include forest clearcuts, a transition phase between forest and agricultural land, the temporary clearing of vegetation, and changes due to natural causes (e.g. fire, flood, etc.)

40. Forested Upland - Areas characterized by tree cover (natural or semi-natural woody vegetation, generally greater than 6 meters tall); tree canopy accounts for 25-100 percent of the cover.

41. Deciduous Forest - Areas dominated by trees where 75 percent or more of the tree species shed foliage simultaneously in response to seasonal change.

42. Evergreen Forest - Areas dominated by trees where 75 percent or more of the tree species` maintain their leaves all year. Canopy is never without green foliage.

43. Mixed Forest - Areas dominated by trees where neither deciduous nor evergreen species

represent more than 75 percent of the cover present.

50. Shrubland - Areas characterized by natural or semi-natural woody vegetation with aerial stems, generally less than 6 meters tall, with individuals or clumps not touching to interlocking. Both evergreen and deciduous species of true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions are included.

51. Shrubland - Areas dominated by shrubs; shrub canopy accounts for 25-100 percent of the cover. Shrub cover is generally greater than 25 percent when tree cover is less than 25 percent. Shrub cover may be less than 25 percent in cases when the cover of other life forms (e.g. herbaceous or tree) is less than 25 percent and shrubs cover exceeds the cover of the other life forms.

60. Non-Natural Woody - Areas dominated by non-natural woody vegetation; non-natural woody vegetative canopy accounts for 25-100 percent of the cover. The non-natural woody classification is subject to the availability of sufficient ancillary data to differentiate non-natural woody vegetation from natural woody vegetation.

61. Orchards/Vineyards/Other - Orchards, vineyards, and other areas planted or maintained for the production of fruits, nuts, berries, or ornamentals.

70. Herbaceous Upland - Upland areas characterized by natural or semi-natural herbaceous vegetation; herbaceous vegetation accounts for 75-100 percent of the cover.

71. Grasslands/Herbaceous - Areas dominated by upland grasses and forbs. In rare cases, herbaceous cover is less than 25 percent, but exceeds the combined cover of the woody species present. These areas are not subject to intensive management, but they are often utilized for grazing.

80. Planted/Cultivated - Areas characterized by herbaceous vegetation that has been planted or is intensively managed for the production of food, feed, or fiber; or is maintained in developed settings for specific purposes. Herbaceous vegetation accounts for 75-100 percent of the cover.

81. Pasture/Hay - Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops.

82. Row Crops - Areas used for the production of crops, such as corn, soybeans, vegetables, tobacco, and cotton.

83. Small Grains - Areas used for the production of graminoid crops such as wheat, barley, oats, and rice.

84. Fallow - Areas used for the production of crops that do not exhibit visable vegetation as a result of being tilled in a management practice that incorporates prescribed alternation between cropping and tillage.

85. Urban/Recreational Grasses - Vegetation (primarily grasses) planted in developed settings for recreation, erosion control, or aesthetic purposes. Examples include parks, lawns, golf courses, airport grasses, and industrial site grasses.

90. Wetlands - Areas where the soil or substrate is periodically saturated with or covered with water.

91. Woody Wetlands - Areas where forest or shrubland vegetation accounts for 25-100 percent of the cover and the soil or substrate is periodically saturated with or covered with water.

92. Emergent Herbaceous Wetlands - Areas where perennial herbaceous vegetation accounts for 75-100 percent of the cover and the soil or substrate is periodically saturated with or covered with water.

Appendix C: Web-DET

Geodatabase Model
White Paper

ArcGIS Data model for Forest Stewardship Planning and Accomplishment Tracking

Data model support for the Web-DET ArcGIS Server application - (Draft graphic 6/20/2005)

This data model was developed as a cooperative partnership with the US Forest Service Northeast Area State and Private Forestry, Colorado State Forest Service, and ESRI-Denver

Plan metadata objects

WEBDET.PLANINFORMATION

Plan Information contains the main plan data and associations.

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length	Description
OBJECTID	Object ID							
ID		Yes			0	0	38	Internal Plan Information record ID
OWNERSHIPID		Yes			0	0	38	Foreign key to Ownership Table
PLAN_IDNUMBER	String	Yes					40	User define plan ID number
PLAN_NAME	String	Yes					40	User define plan name
PLAN_DATE	Date	Yes			0	0	36	Plan creation date
PLAN_LIFESPAN	String	Yes					20	Plan period
STEWARDSHIPPLAN	Long integer	Yes		Boolean	10			Official Stewardship plan (Y/N)
GOALS_OBJECTIVES	String	Yes					512	Owner defined plan goals
T_E_SPECIES	String	Yes					512	Desc of Threatened or endangered species
WETLANDS	String	Yes					512	Desc of any wetlands found on property
CULTURAL_RESOURCES	String	Yes					512	Desc of cultural resources located on property
SOILS_INFORMATION	String	Yes					512	Desc of soil characteristics on the property
CLIMATE	String	Yes					512	Desc of climatic influences on property
NEIGHBOR_INTERACTION	String	Yes					512	Desc of neighbor interaction
PERENNIAL_STREAM_LEN	Double	Yes			38	8		Length of streams that cross the property
PERENNIAL_STREAM_LEN_UOM	Long integer	Yes		Linear_UOM	10			Perennial stream length units of measure
FARM_SERVICE_AGENCY	String	Yes					20	Participate in farm service programs
TREE_FARM	Long integer	Yes		Boolean	10			National Tree Farm system (Y/N)
STATE_FORESTRY_PROGRAM	Long integer	Yes		Boolean	10			State program participation
PERM_FORESTRY_RES	String	Yes					25	Conservation easement/restriction
THIRD_PARTY_CERTIFICATION	String	Yes					20	Certification program designation
REGIONAL_CONS_CONCERNS	String	Yes					512	Description of regional conservation issues
PRIMARY_FOREST_TYPES	String	Yes					512	Description of dominant forest type
BOUNDARY_MARKED	Long integer	Yes		Boolean	10			Boundaries marked (Y/N)
BOUNDARY_MARK_DESC	String	Yes					512	Description of boundary marks
TOTAL_ACRES	Double	Yes			38	8		Total plan acres
FORESTED_ACRES	Double	Yes			38	8		Forested acres contained in the plan
STEWARDSHIP_ACRES	Double	Yes			38	8		Acres of forest stewardship plan
ACTIVE	Long integer	Yes		Boolean	10			Is the plan active (Y/N)
DATE_INACTIVE	Date	Yes			0	0	36	Date plan became inactive
CLASSIFIED_FOREST_PROGRAM	String	Yes					20	Tax abatement program
NEXT_ENTRY	String	Yes					30	Date plan became inactive
PROJECT_HOURS_TOTAL	Long integer	Yes			10			Total hours for stewardship planning
PROJECT_COST_RETURN	Double	Yes			38	8		

Relationship class PlanInfoCostShareAssociation
Type Composite; Cardinality One to many; Notification None; Forward label CostSharePlanInfo; Backward label PlanInfoCostShare
Origin table — Name: PLANINFORMATION; Primary key: ID; Foreign key: ID. Destination table — Name: PLANCOSTSHARE
No relationship rules defined.

Relationship class PlanAddress
Type Composite; Cardinality One to one; Notification Forward; Forward label: AddressOnPlanInfo; Backward label: PlanInfoPropertyAddress
Origin table — Name: PLANINFORMATION; Primary key: ID; Foreign key: ID. Destination table — Name: PROPERTYADDRESS
No relationship rules defined.

PLANCOSTSHARE

Plan cost share information

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length	Description
OBJECTID	Object ID							
ID		Yes			0	0	38	Table internal ID number
COSTSHAREID		Yes			0	0	38	Cost share record ID
COSTSHARECODE	Long integer	Yes		Plan_costshare_domain	10			Cost share program code
COSTSHAREDESC	String	Yes					256	Description of cost share program
ESTIMATEDACREAGE	Double	Yes			38	8		User estimate acreage associated with cost share program

PROPERTYADDRESS

Address of physical plan property

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length	Description
OBJECTID	Object ID							
ID		Yes			0	0	38	Internal record ID
PROPERTY_PARCELID	String	Yes					50	Assessor/Tax parcel ID
PROPERTY_ADDRESS	String	Yes					50	Street Address
PROPERTY_CITY	String	Yes					30	City
PROPERTY_ST	Long integer	Yes		State_domain	10			State
PROPERTY_ZIPCODE	String	Yes					10	Zipcode
PROPERTY_PHONE	String	Yes					12	Phone number
PROPERTY_EMAIL	String	Yes					50	E-mail address at property
PROPERTY_LEGAL	String	Yes					255	Property legal description
PROPERTY_COUNTY	String	Yes					30	Place a succinct description of the field in this text
PROPERTY_DIRECTIONS	String	Yes					256	Description of directions to property
PROPERTY_DESC	String	Yes					256	Description of property

OWNERSHIP

Ownership information

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
OWNERSHIPID		Yes			0	0	38
OWNER_FIRST_NAME	String	Yes					50
OWNER_LAST_NAME	String	Yes					50
OWNER_ADDRESS1	String	Yes					50
OWNER_ADDRESS2	String	Yes					50
OWNER_CITY	String	Yes					30
OWNER_ST	Long integer	Yes		State_domain	10		
OWNER_ZIPCODE	String	Yes					10
OWNER_PHONE	String	Yes					12
OWNER_EMAIL	String	Yes					50
PREPARER_ST_OF_ORIGIN	Long integer	Yes		State_domain	10		

PREPARERVERSIONS

Used to control plan status

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
ACCESSCONTROLID		Yes			0	0	38
PREPARERID		Yes			0	0	38
VERSIONNAME	String	Yes					30
PLANNAME	String	Yes					40
STATUS	Long integer	Yes		PlanStatus_domain	10		
PREPARER_ST_OF_ORIGIN	Long integer	Yes		State_domain	10		
CHECKED_OUT	Long integer	Yes		Boolean	10		

PROJECTPREPARER

Project preparer, controls access to the Web-DET application

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
PREPARERID		Yes			0	0	38
PREPARER_FIRST_NAME	String	Yes					30
PREPARER_LAST_NAME	String	Yes					30
PREPARER_ORGANIZATION_NAME	String	Yes					30
PREPARER_ORGANIZATION_UNIT	String	Yes					30
PROJECT_LEADER_FIRST_NAME	String	Yes					30
PROJECT_LEADER_LAST_NAME	String	Yes					30
LEADER_ORGANIZATION_NAME	String	Yes					30
LEADER_ORGANIZATION_UNIT	String	Yes					30
PREPARER_ADDRESS1	String	Yes					50
PREPARER_ADDRESS2	String	Yes					50
PREPARER_CITY	String	Yes					50
PREPARER_ST	Long integer	Yes		State_domain	10		
PREPARER_ZIPCODE	String	Yes					10
PREPARER_PHONE	String	Yes					12
PREPARER_EMAIL	String	Yes					30
USERNAME	String	Yes					30
USERPASSWORD	String	Yes					30
ACCESS_LEVEL	Long integer	Yes	2	access_level	10		

GEOPOLITICALASSOCIATIONS

Used to control automated overlay between Managed Areas and other spatial layers.

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length	Description
OBJECTID	Object ID							
FEATURECLASS	String	Yes					30	Source feature class
SOURCECOLUMN	String	Yes					30	Column in source to extract value
TARGETCLASS	String	Yes					30	Target table
TARGETCOLUMN	String	Yes					30	Target column to receive value

ManagedArea / LinearEventLocation / PointEventLocation

Relationship class ManagedAreaGeoPolitical, LinearEventGeoPolitical, PointEventGeoPolitical
Type Simple; Cardinality One to one; Notification None; Forward label: GeopoliticalOn"Feature"; Backward label: "feature"GeoPolitical
Origin feature class — Name "Feature"Location; Primary key "Feature"ID; Foreign key ID. Destination table — Name GEOPOLITICAL
No relationship rules defined.
"Feature" includes LinearEvent, PointEvent, and ManagedArea features

GEOPOLITICAL

Attributes from polygon overlay.

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
ID		Yes			0	0	38
ST_FOREST_DISTRICT	String	Yes					20
ST_FOREST_REGION	String	Yes					20
USFS_RANGER_DISTRICT	String	Yes					80
USFS_NATIONAL_FOREST	String	Yes					80
USFS_REGION	String	Yes					2
US_CONG_DIST	String	Yes					2
ST_CONG_DIST	String	Yes					25
ECOREGION	String	Yes					5
WATERSHED	String	Yes					16
STATE_NAME	String	Yes					50
COUNTY_NAME	String	Yes					32
STATE_FIPS	String	Yes					2
COUNTY_FIPS	String	Yes					3
FIPS	String	Yes					5
MUNICIPALITY_TWSP	String	Yes					50

Accomplishment tracking spatial objects

Relationship class LinearEventPlanInfo
Type Composite; Cardinality One to one; Notification Forward; Forward label: LinearEventWithPlanInfo; Backward label: PlanInfoOnLinearEvent
Origin table — Name PLANINFORMATION; Primary key ID; Foreign key ACCESSCONTROLID. Destination feature class — Name LinearEventLocation
No relationship rules defined.

LinearEventLocation

Geometry Polyline; Contains M values No; Contains Z values No

Line feature class used for Accomplishment tracking

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length	Description
OBJECTID	Object ID							
ACCESSCONTROLID		Yes			0	0	38	Access ID
LINEAREVENTID		Yes			0	0	38	Primary Key field
PREPARERID		Yes			0	0	38	Foreign key to preparer table
NAME	String	Yes					255	Event name
LENGTH	Double	Yes			38	8		User defined length
LENGTH_UOM	Long integer	Yes		Linear_UOM	10			Length unit of measures
WIDTH	Double	Yes			38	8		User defined width
WIDTH_UOM	Long integer	Yes		Linear_UOM	10			Width units of measure
CREATED	Date	Yes			0	0	36	Date created
SHAPE	Geometry	Yes						
SHAPE.len	Double	No			0	0		

Relationship class PointEventPlanInfo
Type Composite; Cardinality One to one; Notification Forward; Forward label: PointEventForPlanInformation; Backward label: PlanInformationOnPointEvent
Origin table — Name PLANINFORMATION; Primary key ID; Foreign key ACCESSCONTROLID. Destination feature class — Name PointEventLocation
No relationship rules defined.

PointEventLocation

Geometry Point; Contains M values No; Contains Z values No

Point features used for accomplishment tracking

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length	Description
OBJECTID	Object ID							
ACCESSCONTROLID		Yes			0	0	38	Internal ID
POINTEVENTID		Yes			0	0	38	Primary key for points
PREPARERID		Yes			0	0	38	Preparer ID
NAME	String	Yes					255	Point feature name
CREATED	Date	Yes			0	0	36	Date created
SHAPE	Geometry	Yes						

Spatial objects

Relationship class ManagedAreaPlanInfo
Type Composite; Cardinality One to one; Notification Forward; Forward label ManagedAreaPlanInfo; Backward label PlanInfoManagedArea
Origin table — Name: PLANINFORMATION; Primary key: ID; Foreign key: ACCESSCONTROLID. Destination feature class — Name: ManagedArea
No relationship rules defined.

ManagedArea

Geometry Polygon; Contains M values No; Contains Z values No

Main polygon feature class that stores the ownership boundary for a stewardship plan and polygon accomplishments

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length	Description
OBJECTID	Object ID							
ACCESSCONTROLID		Yes			0	0	38	ID used for access to feature class by Web-DET
MANAGEDAREAID		Yes			0	0	38	ID for internal relationships
PREPARERID		Yes			0	0	38	ID for who entered data
NAME	String	Yes					255	Name of plan or accomplishment
GIS_ACRES	Double	Yes			38	8		Acres calculated from shape
CREATED	Date	Yes			0	0	36	Date created
SHAPE	Geometry	Yes						
SHAPE.area	Double	No			0	0		
SHAPE.len	Double	No			0	0		

Relationship class ManagedAreaGoals
Type Composite; Cardinality One to many; Notification None; Forward label GoalsOnManagedArea; Backward label ManagedAreaGoals
Origin feature class — Name ManagedArea; Primary key MANAGEDAREAID; Foreign key ID. Destination table — Name MANAGEDAREAGOALS
No relationship rules defined.

MANAGEDAREAGOALS

Goals applied to the plan at the Managed Area level

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length	Description
OBJECTID	Object ID							
ID		Yes			0	0	38	ID Number
GOAL	Long integer	Yes	1	ManagedAreaGoals_domain	10			Goal category
GOAL_DESC	String	Yes					512	Description of the goal

Relationship class CompartmentAssociation
Type Composite; Cardinality One to many; Notification None; Forward label Compartment; Backward label CompartmentManagedArea
Origin feature class — Name: ManagedArea; Primary key: MANAGEDAREAID; Foreign key: MANAGEDAREAID. Destination feature class — Name: ManagedAreaCompartment
No relationship rules defined.

Relationship class LineTreatmentAssociation
Type Composite; Cardinality One to many; Notification None; Forward label: ManagedAreaContainingLineTreatment; Backward label LineTreatmentInManagedArea
Origin feature class — Name: ManagedArea; Primary key: MANAGEDAREAID; Foreign key: MANAGEDAREAID. Destination feature class — Name ManagedAreaLinearFeature
No relationship rules defined.

ManagedAreaCompartment

Geometry Polygon; Contains M values No; Contains Z values No

Stewardship plan forest compartments (Optional)

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length	Description
OBJECTID	Object ID							
MANAGEDAREAID		Yes			0	0	38	Primary key for most of Web-DET
COMPARTMENTID		Yes			0	0	38	ID for compartment polygons
COMPARTMENTNAME	String	Yes					30	Compartment name- user defined
COMPARTMENTNUMBER	String	Yes					15	Compartment number - user defined
GIS_ACRES	Double	Yes			38	8		Acres calculated from shape
CREATED	Date	Yes			0	0	36	Date created
SHAPE	Geometry	Yes						
SHAPE.area	Double	No			0	0		
SHAPE.len	Double	No			0	0		

ManagedAreaLinearFeature

Geometry Polyline; Contains M values No; Contains Z values No

Linear features inside a ManagedArea optionally inside a compartment

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length	Description
OBJECTID	Object ID							
MANAGEDAREAID		Yes			0	0	38	Foreign key field to ManagedAreas
COMPARTMENTID		Yes			0	0	38	Foreign Key to Compartments
LTID		Yes			0	0	38	LineType ID
LENGTH	Double	Yes			38	8		User defined length
LENGTH_UOM	Long integer	Yes		Linear_UOM	10			User defined length unit of measure
WIDTH	Double	Yes			38	8		User defined width
WIDTH_UOM	Long integer	Yes		Linear_UOM	10			User defined width unit of measure
CREATED	Date	Yes			0	0	36	Date created
SHAPE	Geometry	Yes						
SHAPE.len	Double	No			0	0		

Relationship class CompartmentLinearFeature
Type Simple; Cardinality One to many; Notification None; Forward label LinearFeatureInCompartment; Backward label CompartmentForLinearFeature
Origin feature class — Name: ManagedAreaCompartment; Primary key: COMPARTMENTID; Foreign key: COMPARTMENTID. Destination feature class — Name: ManagedAreaLinearFeature
No relationship rules defined.

Relationship class PointTreatment_association
Type Composite; Cardinality One to many; Notification None; Forward label PointTreatment; Backward label PointTreatment_ManagedArea
Origin feature class — Name: ManagedArea; Primary key: MANAGEDAREAID; Foreign key: MANAGEDAREAID. Destination feature class — Name ManagedAreaPointFeature
No relationship rules defined.

Relationship class CompartmentPointFeature
Type Simple; Cardinality One to many; Notification None; Forward label PointFeatureInCompartment; Backward label CompartmentForPointFeature
Origin feature class — Name: ManagedAreaCompartment; Primary key: COMPARTMENTID; Foreign key: COMPARTMENTID. Destination feature class — Name: ManagedAreaPointFeature
No relationship rules defined.

ManagedAreaPointFeature

Geometry Point; Contains M values No; Contains Z values No

Point Features Inside a ManagedArea and optionally inside a compartment

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length	Description
OBJECTID	Object ID							
MANAGEDAREAID		Yes			0	0	38	Foreign key field to ManagedAreas
COMPARTMENTID		Yes			0	0	38	Foreign Key to compartments
PTID		Yes			0	0	38	Point ID
CREATED	Date	Yes			0	0	36	Date created
SHAPE	Geometry	Yes						

Relationship class StandAssociation
Type Composite; Cardinality One to many; Notification None; Forward label Stands; Backward label ManagedArea
Origin feature class — Name: ManagedArea; Primary key: MANAGEDAREAID; Foreign key: MANAGEDAREAID. Destination feature class — Name ManagedAreaStand
No relationship rules defined.

Relationship class CompartmentStand
Type Simple; Cardinality One to many; Notification None; Forward label StandInCompartment; Backward label CompartmentforStand
Origin feature class — Name: ManagedAreaCompartment; Primary key: COMPARTMENTID; Foreign key: COMPARTMENTID. Destination feature class — Name ManagedAreaStand
No relationship rules defined.

ManagedAreaStand

Geometry Polygon; Contains M values No; Contains Z values No

Forest stands inside a Managed area and optionally inside a compartment

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length	Description
OBJECTID	Object ID							
MANAGEDAREAID		Yes			0	0	38	Foreign key to ManagedAreas
COMPARTMENTID		Yes			0	0	38	Foreign key to Compartments
STANDID		Yes			0	0	38	Dtand ID
GIS_ACRES	Double	Yes			38	8		GIS Calculated acres
CREATED	Date	Yes			0	0	36	Date created
SHAPE	Geometry	Yes						
SHAPE.area	Double	No			0	0		
SHAPE.len	Double	No			0	0		

Relationship class ManagedAreaStandExistCond
Type Composite; Cardinality One to one; Notification None; Forward label: StandExistingCondition; Backward label: ExistingConditionOnStand
Origin feature class — Name: ManagedAreaStand; Primary key: STANDID; Foreign key: STANDID. Destination table — Name: STANDEXISTINGCONDITION
No relationship rules defined.

Relationship class ManagedAreaStandPotential
Type Composite; Cardinality One to one; Notification None; Forward label PotentialOnStand; Backward label StandPotential
Origin feature class — Name: ManagedAreaStand; Primary key: STANDID; Foreign key: STANDID. Destination table — Name: STANDPOTENTIAL
No relationship rules defined.

Forest Inventory objects

STANDEXISTINGCONDITION

Stand level polygon summary inventory information

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length	Description
OBJECTID	Object ID							
STANDID		Yes			0	0	38	Stand ID number
STAND_NAME	String	Yes					40	Stand name
STAND_DESC	String	Yes					512	Description of stand
SIZE_CLASS	Long integer	Yes	8	size_class_domain	10			Dominant vegetation size class
STOCKING_LEVEL	String	Yes					40	Stocking level
TREES_ACRE	String	Yes					40	Number of trees per acre
MEAN_STAND_DIA	String	Yes					40	Mean stand diameter
BASAL_AREA	String	Yes					40	Stand basal area
ACCEPT_BASAL_AREA	String	Yes					40	Basal area measurement
STAND_VOLUMN	String	Yes					40	Stand volumn
STAND_VOL_UNITS	Long integer	Yes		Volume_type_domain	10			Stand volume unit of measurement
SITE_INDEX	String	Yes					40	Stand site index
SITE_INDEX_SPC	String	Yes					40	Stand site index indicator species
EST_GROWTH	String	Yes					40	Place a succinct description of the field in this text
ACRES	String	Yes					40	Estimated growth
COVER_TYPE1	String	Yes					50	Dominant cover type 1
COVER_TYPE2	String	Yes					50	Dominant cover type 2
AGE	String	Yes					25	Stand age
DOMINANT_VEG	String	Yes					255	Dominant vegetation
HISTORY	String	Yes					255	Description of stand history
HEALTH	String	Yes					255	Description of stand health
I_D_ACTIVITY	String	Yes					255	Description of Insect and Disease occurrence in stand
SITE_QUALITY	Long integer	Yes		site_quality_domain	10			Stand site quality value
SITE_QUALITY_DESC	String	Yes					255	Description of site quality
TIMBER_QUALITY	Long integer	Yes		timber_quality	10			Stand timber quality value
TIMBER_QUALITY_DESC	String	Yes					255	Description of timber quality
NATURAL_FEATURES	String	Yes					255	Description of natural features of interest
MANMADE_FEATURES	String	Yes					255	Description of man made features of interest
WATER_QUALITY	String	Yes					255	Description of water quality issues
TIMBER_CRUISE_TYPE	String	Yes					50	Timber cruise method
TIMBER_CRUISE_ACCURACY	String	Yes					255	Timber cruise accuracy assessment
FIRE_HAZARD_RATING	String	Yes					25	Fire hazard rating
FIRE_HAZARD_RATING_METHOD	String	Yes					20	Fire hazard rating method
SOIL_TYPE	String	Yes					50	Soil types found in the stand (codes)
OP_LIMITS	String	Yes					255	Description of operational limits on stand
CURRENT_ACCESS	Long integer	Yes		Boolean	10			Current access (Y/N)
NOXIOUS_WEEDS	String	Yes					255	Description of noxious weeds found in stand
SHRUB_LAYER	String	Yes					255	Description of shrub layer
GROUND_COVER	String	Yes					255	Description of ground cover
T_E_SPECIES	String	Yes					255	Description of threatened and endangered species found in stand
WETLANDS	String	Yes					255	Description of wetlands in the stand
REGENERATION_STOCKING	String	Yes					255	Description of the regeneration stock

STANDPOTENTIAL

Stand level description of desired future condition (DFC)

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length	Description
OBJECTID	Object ID							
STANDID		Yes			0	0	38	Internal Stand ID number
RECREATION_POTENTIAL	Long integer	Yes		Potential_domain	10			Recreation DFC score
RECREATION_POTENTIAL_DESC	String	Yes					512	Description of recreation DFC
WILDLIFE_POTENTIAL	Long integer	Yes		Potential_domain	10			Wildlife DFC
WILDLIFE_POTENTIAL_DESC	String	Yes					512	Description of Wildlife DFC
SOIL_RESOURCES	Long integer	Yes		Potential_domain	10			Soil resource DFC
SOIL_RESOURCES_DESC	String	Yes					512	Description of Soil resource DFC
WATER_POTENTIAL	Long integer	Yes		Potential_domain	10			Water yield/quality potential DFC
WATER_POTENTIAL_DESC	String	Yes					512	Description of Water yield/quality potential DFC
TIMBER_POTENTIAL	Long integer	Yes		Potential_domain	10			Timber DFC
TIMBER_POTENTIAL_DESC	String	Yes					512	Description of Timber DFC
FOREST_HEALTH_POTENTIAL	Long integer	Yes		Potential_domain	10			Forest health DFC
FOREST_HEALTH_POTENTIAL_DESC	String	Yes					512	Description of Forest health DFC
FISH_POTENTIAL	Long integer	Yes		Potential_domain	10			Fisheries DFC
FISH_POTENTIAL_DESC	String	Yes					512	Description of Fisheries DFC
CULTURAL_RES_POTENTIAL	Long integer	Yes		Potential_domain	10			Cultural DFC
CULTURAL_RES_POTENTIAL_DESC	String	Yes					512	Description of Cultural DFC
WETLANDS_POTENTIAL	Long integer	Yes		Potential_domain	10			Wetlands/riparian DFC
WETLANDS_POTENTIAL_DESC	String	Yes					512	Description of Wetlands/riparian DFC
T_E_POTENTIAL	Long integer	Yes		Potential_domain	10			Threatened and endangered species DFC
T_E_POTENTIAL_DESC	String	Yes					512	Description of Threatened and endangered species DFC
RANGE_POTENTIAL	Long integer	Yes		Potential_domain	10			Range/pasture DFC
RANGE_POTENTIAL_DESC	String	Yes					512	Description of Range/pasture DFC
AESTHETIC_POTENTIAL	Long integer	Yes		Potential_domain	10			Visual aesthetic DFC
AESTHETIC_POTENTIAL_DESC	String	Yes					512	Description of Visual aesthetic DFC

Activities and Practices objects

ManagedArea — **Relationship class ManagedAreaActivity**
Type Composite; Cardinality One to many; Notification None; Forward label: ActivityOnManagedArea; Backward label: ManagedAreaActivity
Origin feature class — Name ManagedArea; Primary key MANAGEDAREAID; Foreign key ID. Destination table — Name ACTIVITY
No relationship rules defined.

ManagedAreaLinearFeature — **Relationship class ManagedAreaLinearActivity**
Type Simple; Cardinality One to many; Notification None; Forward label: ActivityOnManagedAreaLine; Backward label: ManagedAreaLinearActivity
Origin feature class — Name: ManagedAreaLinearFeature; Primary key: LTID; Foreign key: ID. Destination table — Name ACTIVITY
No relationship rules defined.

ManagedAreaStand — **Relationship class ManagedAreaStandActivity**
Type Simple; Cardinality One to many; Notification None; Forward label: ActivityInManagedAreaStand; Backward label: ManagedAreaStandActivity
Origin feature class — Name ManagedAreaStand; Primary key STANDID; Foreign key ID. Destination table — Name ACTIVITY
No relationship rules defined.

ManagedAreaPointFeature — **Relationship class ManagedAreaPointActivity**
Type Simple; Cardinality One to many; Notification None; Forward label: ActivityOnManagedAreaPoint; Backward label: ManagedAreaPointActivity
Origin feature class — Name ManagedAreaPointFeature; Primary key PTID; Foreign key ID. Destination table — Name ACTIVITY
No relationship rules defined.

LinearEventLocation — **Relationship class LinearEventActivity**
Type Simple; Cardinality One to many; Notification None; Forward label LinearEventActivity; Backward label ActivityOnLinearEvent
Origin feature class — Name LinearEventLocation; Primary key LINEAREVENTID; Foreign key ID. Destination table — Name ACTIVITY
No relationship rules defined.

PointEventLocation — **Relationship class PointEventActivity**
Type Simple; Cardinality One to many; Notification None; Forward label ActivityOnPointEvent; Backward label PointEventActivity
Origin feature class — Name PointEventLocation; Primary key POINTEVENTID; Foreign key ID. Destination table — Name ACTIVITY
No relationship rules defined.

ACTIVITY

Activities table

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length	Description
OBJECTID	Object ID							
ID		Yes			0	0	38	Internal Table ID number
ACTIVITYID		Yes			0	0	38	Activity ID value
COSTSHAREID		Yes			0	0	38	Cost share ID value
ACTIVITY_TYPE	Long integer	Yes	8		10			Activity type
ACTIVITY_PRACTICE	Long integer	Yes			10			Activity practice
ACTIVITY_YEAR	String	Yes					255	Activity year
ACTIVITY_DESCRIPTION	String	Yes					255	Description of activity
ACTIVITY_PRIORITY	Long integer	Yes		Activity_priority_domain	10			Activity priority
ACTIVITY_ACRES	Long integer	Yes			10			User defined acres for activity (may not match polygon)
STATUS	Long integer	Yes	1	status_domain	10			Completion status
VOLUMN_HARVESTED	String	Yes					20	Volume of material harvested during activity
VOLUME_TYPE	Long integer	Yes		Volume_type_domain	10			Volume harvest units of measure
PRODUCT	Long integer	Yes		Product_domain	10			Product produced
COMMENTS	String	Yes					255	User entered comment
ACTIVITY_MODE	Long integer	Yes	1	activity_mode	10			Activity mode
ACTIVITY_START_YEAR	String	Yes					255	Year active commenced
ACTIVITY_END_YEAR	String	Yes					255	Year activity ended
ACTIVITY_FREQUENCY	Long integer	Yes		activity_frequency	10			Frequency of occurrence of activity

Subtypes of ACTIVITY
Subtype field ACTIVITY_TYPE
Default subtype 8

List of defined default values and domains for subtypes in this class

Subtype Code	Subtype Description	Field name	Default value	Domain
1	Fire	ACTIVITY_PRACTICE		FACTS_Fire
		ACTIVITY_PRIORITY		Activity_priority_domain
		STATUS	1	status_domain
		VOLUME_TYPE		Volume_type_domain
		PRODUCT		Product_domain
		ACTIVITY_MODE	1	activity_mode
		ACTIVITY_FREQUENCY		activity_frequency
2	Range	ACTIVITY_PRACTICE		FACTS_Range
		ACTIVITY_PRIORITY		Activity_priority_domain
		STATUS	1	status_domain
		VOLUME_TYPE		Volume_type_domain
		PRODUCT		Product_domain
		ACTIVITY_MODE	1	activity_mode
		ACTIVITY_FREQUENCY		activity_frequency
3	Soil_Air_Water	ACTIVITY_PRACTICE		FACTS_Soil_Air_Watershed
		ACTIVITY_PRIORITY		Activity_priority_domain
		STATUS	1	status_domain
		VOLUME_TYPE		Volume_type_domain
		PRODUCT		Product_domain
		ACTIVITY_MODE	1	activity_mode
		ACTIVITY_FREQUENCY		activity_frequency
4	Fish_Wildlife	ACTIVITY_PRACTICE		FACTS_Fish_Wildlife_TES
		ACTIVITY_PRIORITY		Activity_priority_domain
		STATUS	1	status_domain
		VOLUME_TYPE		Volume_type_domain
		PRODUCT		Product_domain
		ACTIVITY_MODE	1	activity_mode
		ACTIVITY_FREQUENCY		activity_frequency
5	Cultural	ACTIVITY_PRACTICE		FACTS_Cultural_Res_Rec
		ACTIVITY_PRIORITY		Activity_priority_domain
		STATUS	1	status_domain
		VOLUME_TYPE		Volume_type_domain
		PRODUCT		Product_domain
		ACTIVITY_MODE	1	activity_mode
		ACTIVITY_FREQUENCY		activity_frequency
6	Engineering	ACTIVITY_PRACTICE		FACTS_Engineering
		ACTIVITY_PRIORITY		Activity_priority_domain
		STATUS	1	status_domain
		VOLUME_TYPE		Volume_type_domain
		PRODUCT		Product_domain
		ACTIVITY_MODE	1	activity_mode
		ACTIVITY_FREQUENCY		activity_frequency
7	Miscellaneous	ACTIVITY_PRACTICE		FACTS_Miscellaneous
		ACTIVITY_PRIORITY		Activity_priority_domain
		STATUS	1	status_domain
		VOLUME_TYPE		Volume_type_domain
		PRODUCT		Product_domain
		ACTIVITY_MODE	1	activity_mode
		ACTIVITY_FREQUENCY		activity_frequency
8	Timber_Silviculture	ACTIVITY_PRACTICE		FACTS_Timber_Silviculture
		ACTIVITY_PRIORITY		Activity_priority_domain
		STATUS	1	status_domain
		VOLUME_TYPE		Volume_type_domain
		PRODUCT		Product_domain
		ACTIVITY_MODE	1	activity_mode
		ACTIVITY_FREQUENCY		activity_frequency

Relationship class ActivityManagementDesignation
Type Composite; Cardinality One to one; Notification None; Forward label: ActivityManagementDesignation; Backward label: ManagementDesignationforActivity
Origin table — Name: ACTIVITY; Primary key: ACTIVITYID; Foreign key: ID. Destination table — Name: MANAGEMENTDESIGNATION
No relationship rules defined.

MANAGEMENTDESIGNATION

Management designation table designed to support state level codes for activities.

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length	Description
OBJECTID	Object ID							
ID		Yes			0	0	38	Row ID
MANAGEMENTDESIGNATION	Long integer	Yes	1		10			Code subtype
MANAGEMENTREPORTITEM	Long integer	Yes			10			Code value
REPORTQUANTITY	String	Yes					255	Reporting quantity
REPORTUNITS	String	Yes					255	Reporting quantity units

Subtypes of MANAGEMENTDESIGNATION
Subtype field MANAGEMENTDESIGNATION
Default subtype 1

List of defined default values and domains for subtypes in this class

Subtype Code	Subtype Description	Field name	Default value	Domain
1	Stewardship_Plan	MANAGEMENTREPORTITEM	999	Stewardship_plan_domain
2	National_fire_plan	MANAGEMENTREPORTITEM	999	National_Fire_plan_domain
3	Forestry_consultation	MANAGEMENTREPORTITEM	999	Forestry_consultation_domain
4	CO_State_forestry	MANAGEMENTREPORTITEM	999	CO_State_Forestry_domain

Appendix D: SAP Data Migration

Merging SAP Data Between ArcGIS Geodatabase Versions.pdf
Merging SAP Data Between Stewardship Access Database and ArcGIS Geodatabase.pdf

Merging SAP Data Between ArcGIS Geodatabase Versions

The following instructions document how the Colorado State Forest Service imported SAP data from previous geodatabase (gdb) versions to the final version. Data was only imported from the Managed Area feature class, so if other spatial components of the gdb have been populated, this process becomes complicated, although the basic process remains the same.

Begin with a blank copy of the gdb.

1. Disable the GUID auto-generate functions in Access (see step 6 for more information).
    1. Open the gdb in Microsoft Access.
    2. Open the GDB_ObjectClasses table.
    3. From the EXTCLSID column, delete the fields containing text.

This step allows all feature classes and tables to be copied without GUIDs being generated when new records are added to the table or feature class. It is a good idea to save a clean copy of the blank gdb elsewhere, in case the auto-generate function is to be re-enabled. To do so, copy the information in the EXTCLSID field in the blank gdb version, then copy into the same field in the populated version of the gdb.

2. Open an ArcMap document with both versions of the gdb, containing the Managed Area feature class, as well as any tables that may contain information to be merged (such as PLANINFORMATION, ACTIVITY, OWNERSHIP, and PROPERTYADDRESS).

3. Add a text field (50 characters) to the origin (previous gdb version) feature class (FC), 1 for each GUID to be merged.
This is accomplished by opening the table (outside of an editing session), click options, then Add Field.... Title the field appropriately, then identify it as a text data type, with a character length of 50.

4. Populate those text fields with the corresponding GUID in the origin FC table.
Example: ACCESSCONTROLID to acID_text.
This step must be done inside an editing session. Open the table, right-click the empty text field header then click Calcute Values.... When the Calculate Values dialog box opens, make sure the new text field will be calculated from the original GUID field to be copied. Do this for each GUID field to be copied. Save your edits.

5. Export the FC with the newly created fields as a shapefile and add to the map document. The FC must be exported and joined as a shapefile because ArcMap will not edit joined columns directly.
Right-click on the FC to be exported, go to Data, then click Export Data. Name the shapefile appropriately, then save as a shapefile in a designated folder (Make sure these are named and filed in an organized fashion. If this step is necessary for many feature classes or tables, it gets confusing if these are not managed well.). Add the new shapefile to the map document (Once the shapefile is saved, ArcMap should ask if you want to add the exported data to the map document, click yes.).

6. Select the features to be merged, then copy and paste them to the destination FC.
Inside an editing session, select the features to be copied and moved. Look to the editing toolbar to make sure the task is to Create new Feature, and the target is the destination (final gdb version) FC. Click copy, then paste. The selected features have now been added to the destination FC (If this was performed without disabling the auto-generate function in the gdb, all of the copied features would have a new GUID, since the original GUID from the previous version is used to manage the relationships in the gdb, this function is disabled.)

7. With the features still selected, join the destination FC with the exported shapefile via the NAME field (Keeping the features selected through this process will help to identify the features to be updated. If there are several gdb versions to merge, the selected features are easily identified in the table, making sure GUIDs are calculated to their corresponding feature.).
Right-click the destination FC, go to Joins and Relates, then click Join.... Follow the instructions in the join dialog box to join the destination feature class with the exported shapefile on the NAME field. This is how the GUID field will be populated with the origin FC GUIDs.

8. Calculate the values of each GUID for the newly pasted features the same way the were calculated in step 4. This time, calculate the GUIDs from the corresponding text field in the joined shapefile. Save and close the map document.

Now the non-spatial elements of the gdb will be merged (in Access).

9. Open two Access windows, one containing the origin gdb, the other the destination gdb.

10. Open the table in the origin gdb you wish to copy. Copy and paste the origin table to the destination table. If the destination table contains different columns than the origin table, copy and paste each column separately.
Select all of the table (click the box in the upper-left of the table to select the entire table automatically.). Copy the table (Ctrl-C). Select the first record in the destination table and paste the table contents (Ctrl-V). To copy and paste each column separately, select the first column by clicking the column header, then copy and paste. Do this for each column to be merged.

11. Repeat step 10 for each table to be merged.

12. Open the map document saved earlier and identify several features to make sure gdb relationships have been maintained.
Use the identify tool in the tools toolbar, select the feature, and view the information related to that feature, checking to see GUIDs and other information has been maintained.

Appendix E: National SAP Documents

Datalayer Purpose and Outcome.pdf
Forest Stewardship Program Spatial Analysis Project.pdf
WFLC_Web-DET_IssueBrief_090905.pdf
WO_SAP_brief_091804.pdf

DATALAYER DEVELOPMENT – PURPOSE, AVAILABILITY, and DATA SOURCES
{February 2002}

Common DATALAYERS included in the SAP

PROXIMITY TO PUBLIC LAND – Forest Management? Status – This layer starts with the assumption that Public lands are in a permanently protected status, and identifies private lands under permanent protection status (easements, or other), further refining our understanding of those lands that should be considered of potential interest, to build from in identifying connectivity.

FOREST PATCHES – Forest Patch Size – We agreed that generally speaking, large patch size is more important than small, while also recognizing that for some species/forest types a small patch can be more important, based on relative abundance, than a larger patch of another type. We also recognized that "big" would vary from state to state. Each state will need to determine its minimum patch size. Within each State's spectrum of patch sizes, patches of intermediate size will likely be of the most interest, because they provide the greatest potential to benefit from increased Stewardship activity. The integrity of the forest resource is likely somewhat intact, while gaps in the landscape exist.

PRIORITY WATERSHEDS – Watershed Boundary – Discussion about the fineness of scale that should be used, and availability of data, led us to agree that we would use the 8-digit HUC code for defining watershed boundaries. EPA has a process for designating high priority watersheds, but the criteria used in this process result in the prioritization of land where forest cover has been removed, or land that has been agriculturally mismanaged. Category I (those most impaired) watersheds are often those with the least amount of forestland. While it is desirable to focus on the forestland within these impaired watersheds, it is also critical that Category II and III watersheds (often with greater amounts of forestland) are identified as important watersheds, in need of forest stewardship focus and priority. **Each state will establish its existing condition of watersheds and identify the category of watershed most important to focus on in stewardship efforts.**

PUBLIC WATER SUPPLIES – Municipal Water Resource – [see Riparian Area layer below] States should determine the buffer area used to protect Municipal Water Resources on a state-by-state basis. We may wish to use the number of drinking water supply sites within a given 8-digit HUC area as a factor in prioritizing those HUC areas.

During consideration of this layer we diverted to a discussion of the EPA BASINS data set (EPA.GOV/OST/BASINS). Data layers available here may serve as a useful common set for States to consider in their analysis. We agreed that each State would consult BASINS, with help from the FS, as needed**.**

SLOPE – This layer can be used to highlight ease of operability for forest harvesting operations, which can be seen as a good thing – productive forest more likely to remain forest, or unscrupulous harvesting damages the forest. Similarly this can be used as an indicator of the site's erodibility (for some States slope is the only way of getting at

erodibility). Determination of what constitutes low, medium, and high slope will be done on a state-by-state basis. Extent of area covered by high priority slopes will serve to refine the use of this layer.

Both flat and steep slopes should be a higher priority for Stewardship. Flatter slopes are more likely to be subject to harvesting, thus the need to be sure the landowner is well informed of BMPs' and good silviculture, and steep slopes are more likely to be subject to erosion – stewardship can play a role in educating the LO about the care of these sites.

RIPARIAN AREAS – Forest Riparian Areas - This layer will be an important one in stewardship impact analysis. All states have or can derive this layer – MA is using 100 meters instead of the agreed 300 feet – the group determined that this was acceptable. It is likely that land within the buffer zone will be considered higher priority for Stewardship attention.

THREATENED AND ENDANGERED SPECIES – All states have this layer to some degree of accuracy

WETLANDS – Prioritization of this layer will result in using Stewardship to achieve higher degree of protection for wetlands.

CHANGE IN HOUSEHOLD - States need to respond to Ann Steketee within two weeks of conference call top confirm or not availability of relevant data. No response to Anne will be taken as "no data available". [FS provided this datalayer from Census 2000 data]

FOREST HEALTH – Forest Health/History of Traditional Pests – CT may not have data for this layer, in which case the layer would be used on a state-by-state basis. Joel Stocker will research further. For our purposes we only need to identify areas of health risk where we know there is a silvicultural treatment – it doesn't help us to know there is a health risk if we can't do anything about it. [FS provided this datalayer with state pest specialists]

FIRE – Each state has recently completed or will be completing a Fire Protection Assessment, the results of which will be used to assess fire threat.

PRIVATE FORESTLANDS (AND OTHER LANDS POTENTIALLY SERVED BY FOREST STEWARDSHIP PROGRAM – Forest Ownership – There was some discussion on how we were defining this layer. We agreed that this layer would differentiate public (Federal/State/Municipal), private, and corporate ownership. This layer will be useful as a filter in identifying potential areas for future Stewardship outreach. **[Ultimately became part of the MASK]**

Considered but eliminated / dropped from Final SAP Common DATALAYERS

Forest Type – We agreed that for this layer to be useful, we would need to identify which forest types we considered to be most important. This will vary on a state-by-state basis. The importance of the layer is tied to the relative importance of deciduous/coniferous forest across the State. **[DROPPED]**

Recreation Trails – Because of the availability of this data across states varies, this information will be used by states on an **as-available** basis. **[DROPPED]**

Developed Recreation Sites - Because the availability of this data across states varies, this information will be used by states on an **as-available** basis. **[DROPPED]**

Forest Industry – Size of buffers around Forest Industry Operations will be set on an individual basis. This layer can be viewed either as indicating threat (pressure to cut) or as a positive factor, facilitating working forests, and in so doing favoring leaving land in Forest. States will determine on an individual basis which of these scenarios is most appropriate for their conditions. **[DROPPED]**

Demographic Profile/Risk of Development – Barb has not yet had the opportunity to check with Brett Butler on this – She will do so **[DROPPED]**

Eco-Regions – Discussion re the usability of this layer resulted in agreement that would retain the layer. There may be under-represented eco-regions within a state – which would make them a priority for Stewardship attention. Prioritization of eco-regions will be done on a State-by-State basis. **[DROPPED]**

Soil Erodibility – We agreed that we **would not retain** this as a common layer. Erodability will be derived from the Slope information. States with good erodability data may choose to incorporate in their analysis. **[DROPPED]**

Streams/Bodies of Water – States all have and will use their own data for this layer. States will also consult BASINS to see whether better data may be available. This layer will be particularly useful in the analysis phase – characterizing stewardship's impact.
Vernal Pools – the variability in importance of vernal pools across the area led the group to recommend that this layer be considered as nice to include, but **not mandatory. [DROPPED]**

Groundwater Recharge – Not all states have good data for this layer. States will consult EPA's BASINS to determine whether this data might be available there – that failing, like vernal pools this layer will be used on a nice-to-use basis. **[DROPPED]**

303d Impaired Waters – States are unsure of the availability of this data layer. Mark B will contact Al Todd to request information on a source. **[DROPPED]**

Fiscal Year 2004

Forest Stewardship Program Spatial Analysis Project

Capturing impact, establishing baseline, and focusing future efforts through spatial analysis

"We can't know where we're going until we know where we are."

Background

Established through the 1990 Farm Bill, the Forest Stewardship Program (FSP) encourages private forest landowners to manage their lands using professionally prepared forest stewardship plans. These plans consider and integrate forest resources, including timber, wildlife and fish, water, aesthetics, and all associated resources to meet landowner objectives. Nationally, the FSP has been successful in meeting the intent of the program; more than 25 million acres of private forests have been placed under professional forestry management.

Issue

Since its inception, the FSP has been delivered and made available to nonindustrial private forest landowners on a first-come, first-served basis. This customer-friendly approach assists landowners in improving their forest resources; however, it fails to allow assessment of the program's full impact across the landscape. It does not take into consideration the connectivity of stewardship tracts, nor does it target landowners whose forest land has a greater need or opportunity for professional expertise and who may not have been aware of resources and programs available to them. There has been no standard or consistent way to assess the impact that stewardship plans have had on the forest resource as a whole, or in addressing regionally or nationally significant resource issues. Given limited program resources and a demand that exceeds program capacity, FSP coordinators and managers increasingly need to address accountability for results on the ground, assuring the Nation's taxpayers that program implementation is efficient and effective, and positively affects forest resources.

After over a decade of implementation, it is timely to evaluate the impact the Forest Stewardship Program has had on the landscape and position the program to be strategically implemented to more effectively address critical resource management needs in the future, while meeting landowner objectives.

The Project

What: The FSP Spatial Analysis Project (SAP) provides participating States a consistent methodology (while offering them the ability to customize it according to State conditions) to spatially display:

- Important forest lands (rich in natural resources, vulnerable to threat, or both);
- Existing stewardship tracts (properties under stewardship plans); and
- Areas of opportunity to focus future FSP efforts (stewardship potential).

The SAP addresses the following questions, as they relate to the FSP:

1. Where are the State's stewardship tracts?
2. Where are the priority lands (those lands of highest potential to benefit from the FSP)?
3. How do the State's stewardship tracts and priority lands overlap (or not)?
4. Where should greater FSP efforts be considered in the future?
5. What has been the impact of FSP efforts on priority lands and other forest lands?

Why: The SAP responds to the issues identified above by:

- Assessing program effectiveness in serving State-identified critical resource management needs;
- Creating geo-referenced, spatial data displaying stewardship tracts relative to FSP potential;
- Relating factors such as stewardship practices completed and resource condition to help determine future practices that might be most effective in addressing critical needs based on the site-specific resource condition; and
- Providing tools that help States focus future FSP efforts to effectively and efficiently address critical forest resource issues.

Who: The SAP involves each participating State's geographic information system (GIS) staff and FSP coordinator in cooperation with the State Stewardship Coordinating Committee, and USDA Forest Service (FS) resource and GIS specialists.

How: There are three major components to the FSP Spatial Analysis Project:

1. Development of a historic stewardship plan database and associated geo-referenced map of existing stewardship plans in the State, to be maintained on an ongoing basis following initial project completion.
2. Development of a statewide assessment of important forest lands incorporating spatial and tabular display of natural resource data critical to the sustainability of forest resources and the risks or vulnerabilities facing those resources.
3. Analysis of the location of lands currently under stewardship plans and how they relate to the important forest lands in the State, and assessment of how the State intends to use the results of the SAP to guide future FSP activities in conjunction with other assistance programs available to nonindustrial private forest landowners (figure 1).

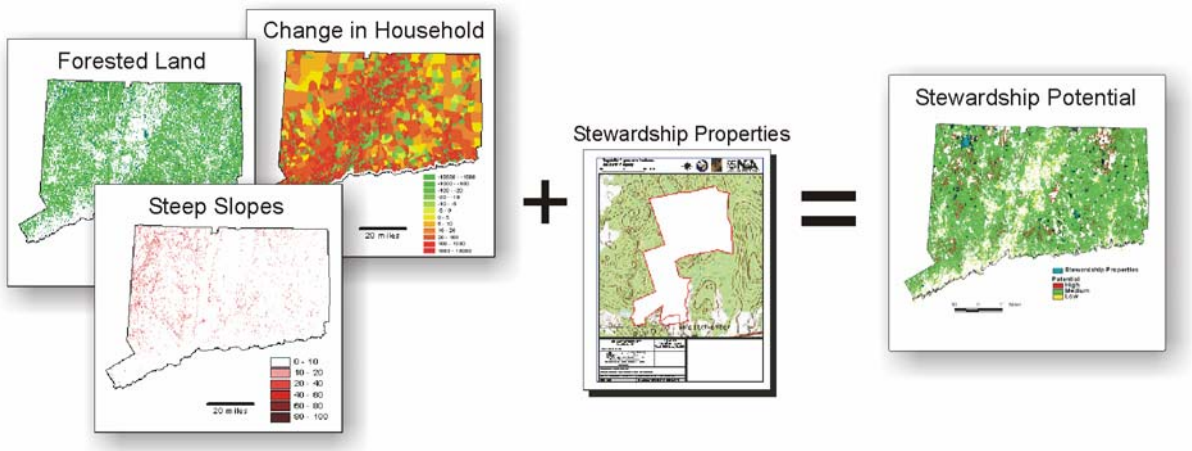


Figure 1. Overall design of the FSP Spatial Analysis Project, Connecticut

When (and How Much!): The SAP is entirely voluntary, driven by both State interest and readiness, and Forest Service and State funding capabilities. As a project within FSP, it is cost-shared with participating States on a 50–50 basis. The total funding amount is to be determined and mutually agreed upon by each State and the Forest Service. On a regular basis (annually or biennially) and as funding permits, FS managers will invite another "tier" of States into the SAP. To date, four States served by the Northeastern Area, State and Private Forestry (Connecticut, Maryland, Massachusetts, and Missouri) have pilot tested the SAP and have preliminary results. Based on these results and intended next steps, the Forest Service is now ready to launch the next tier of States during Fiscal Year 2004.

Details

Stewardship Plan Data Layer: There are two parts to the stewardship plan data layer. Collaboratively, FS database managers and project team members from the four pilot States developed the FS-designed Microsoft Access database structure. This **tabular database** includes stewardship plan date and location, tract size, pertinent resource information (e.g., linear stream length, other resources), pertinent management information (e.g., conservation easement, tax program, tree farm), planned forestry activities and associated practices, and implemented practices and date accomplished. No confidential information is included in this tabular database, although the participating State may choose to link the database to a more detailed database housed entirely and solely by the State.

The **geo-referenced, spatial database** is linked to the tabular database by case number and shows locations of all stewardship tracts in the State. The preferred method is to display stewardship tracts as geo-referenced *polygonal shape files*; however, tract location by center point (centroid) is minimally acceptable. The stewardship plan data layer is prepared at a minimum scale of 1:100,000.

This portion of the SAP project is highly labor intensive, considering that FSP plans developed over the years often exist only as paper copy and must be manually entered into the electronic database, and the tract location scanned and digitized.

Key Point: Once a State participates in the SAP, it is imperative to continue to enter new plans into the electronic database, lending to currency and accuracy. The Forest Service is working with the initial pilot States to develop and test a Web-based tool to allow natural resource professionals preparing the plans to enter the information once electronically, including "drawing" the tract location on Web-based available maps. This step is critical to the long-term success and utility of the SAP and will facilitate future FS reporting requirements.

Statewide Assessment of Important Forest Lands: The statewide assessment focuses on current conditions to help identify the highest need or opportunity for future Forest Stewardship Program delivery. It is a composite of **common data layers** (table 1) determined by the pilot States and FS specialists to spatially map risks or vulnerabilities to existing forest resources, natural resources important to forest sustainability, current public forest land management, and existing stewardship plans (see discussion on *geo-referenced, spatial database*, page 2). The common data layer selection criteria are as follows:

- The attribute (data layer) represents a strong connection to the potential benefits to be derived from the development and implementation of a forest stewardship plan.
- The data source is existing and readily available at the State, regional, or national level.
- The minimum standard of map scale and resolution is consistent across States.
- The vulnerability or resource potential applies across the States (not solely a single-State concern).

Table 1. SAP Common Data Layers

Data Layer	Source*	Scale
Wildfire assessment	Grid analysis on landcover and DEM	30 meter
Forest patches	MRLC	TM 30 meter
Proximity to public land	CT DEP—public, Federal, and municipal lands	1:24000
Private forested lands	MRLC and DEP	30 meter
Threatened and endangered species	DEP—Heritage database	1:24000
Change in households	USFS, Census block data	30-meter grid
Forest pests	USFS	1:24000
Wetlands	DEP/NRCS or USGS	1:24000
Riparian areas	Derived from DEP hydro streams	1:24000
Public water supplies	DEP—Aquifer protection wells and surface water quality layer	1:24000
Slope	Statewide NED DEM layer, USGS	30 meter
Priority watersheds	HUC from USGS	1:100000
Analysis mask (urban, open water, public lands)	MRLC and DEP data sets	30 meter
Stewardship tracts (polygons)	Digitized or town parcel data	variable
Stewardship tracts (centroids)	Polygon script or address match	variable

*Source will vary by State. Connecticut sources shown as an example.

In addition to the common data layers, each participating State has the opportunity to add **State-specific layers** that respond to or reflect conditions or resources unique to the State. Other complementing State assessment efforts, State natural resource specialist or State Stewardship Coordinating Committee recommendations, or a combination of these may drive the need for additional data layers. The State is responsible for providing rationale and metadata for these data layers in addition to the metadata for the common data layers.

A **composite map** with associated tabular data of all GIS common data layers, including the stewardship plan data layer, is then developed. States may choose to include the State-specific data layers on this composite map as well. Based on State Stewardship Coordinating Committee or resource specialist recommendations, the data layers may be weighted to indicate priority. The final product is a statewide map that indicates high, medium, and low potential need for development of forest stewardship plans (figure 2).

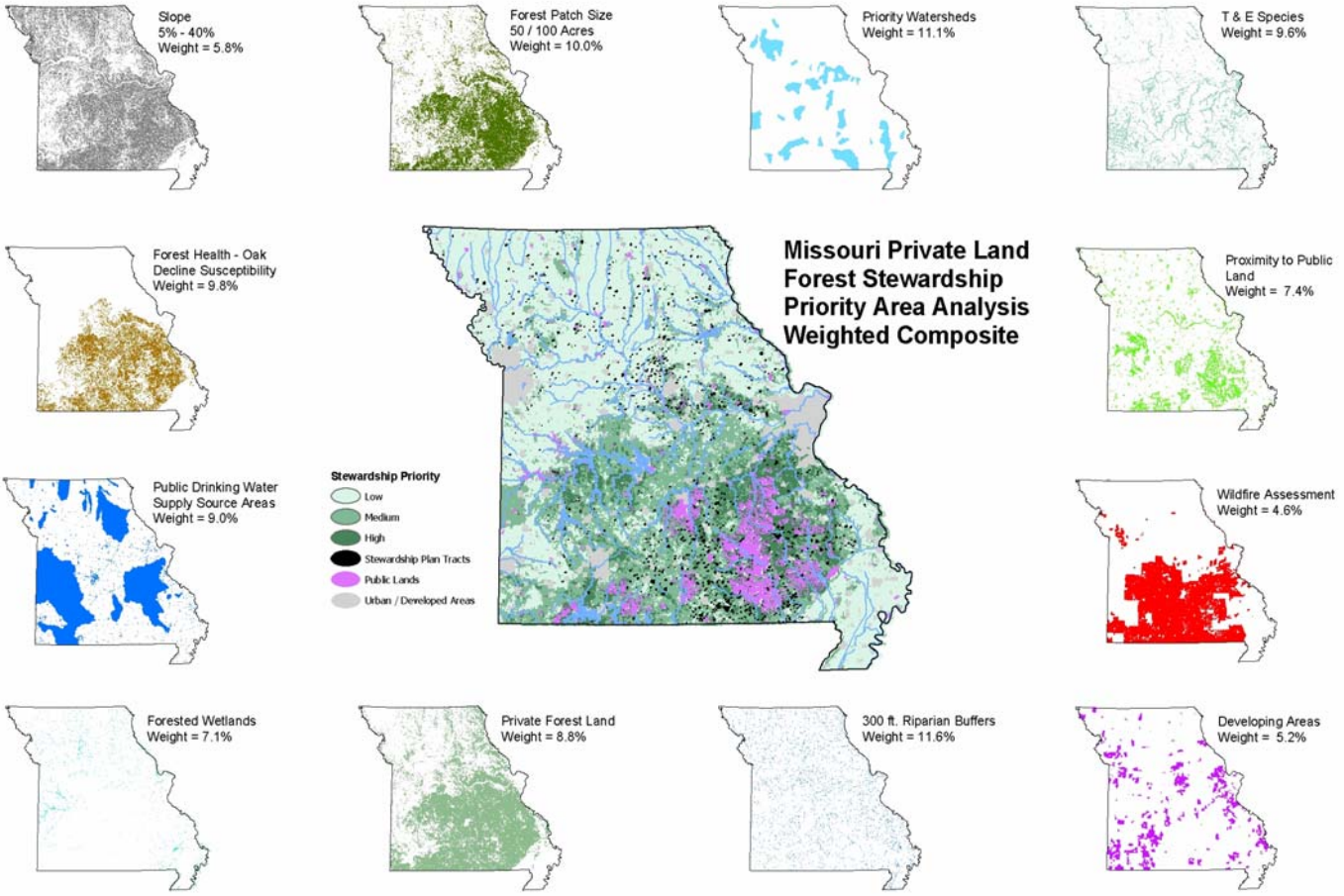


Figure 2. Individual common data layers, contributing to the weighted composite, Missouri

Analysis: The tabular data and accompanying composite map contribute to in-depth statewide analyses that consider how stewardship plans correspond to lands identified as having high, medium, or low potential for Forest Stewardship Program benefit. For those working with private landowners on a local level, the results of the analyses can spatially display the potential for stewardship benefit and guide efforts within a given watershed or service forester jurisdictional area. This will aid not only in plan preparation but also in implementation of the activity practices. The analysis and assessment will lead to informed recommendations, considering the resources and vulnerabilities beyond the boundaries of the tract the plan addresses. Based on where the tract is located and surrounding opportunities or challenges, the professional forester may recommend to the landowner that practices be implemented to complement the surrounding land base or to respond to the landscape surrounding the given tract.

Potential Applications

Ability to show program effort in working on lands impacted by critical resource management issues in conjunction with other landowner assistance programs, not only to landowners and resource managers, but also to the lawmakers who design the programs, appropriate funds, and to whom we are ultimately accountable.

Not only can Forest Stewardship Program results be quantified (in the form of number of acres and number of plans) within a State, those results can also be displayed. The Spatial Analysis Project enables resource managers to demonstrate connectivity in program efforts of plan development and how they complement other natural resource efforts and other State and Private Forestry programs. Through time, they will be able to track the accomplishment of plan-prescribed activities on given stewardship tracts.

The results of this project give resource managers the capability to gather and display information according to geographic area, watershed, congressional district, county, or service area (such as district forester jurisdiction) to assess the amount and type of work completed and yet to do.

Ability to ensure that new stewardship plans consider elements deemed important by the State's Stewardship Coordinating Committee.

The Forest Stewardship Program emphasizes addressing the landowner's objectives through professional forest management. Often a forest landowner is not aware of the importance of the resources on his or her land, particularly as they relate to surrounding properties. A professional forester has an obligation to help the landowner understand the full potential and extent of the resources on the tract. With that body of information, the landowner then has the capability of making informed decisions about long- and short-term objectives.

The Spatial Analysis Project provides key information concerning not only resource potential and vulnerability, but also the extent of professional management occurring around a given tract, respecting private property rights and confidential information. Landowners may find new opportunities to complement the activities already begun in a geographic area, or learn of a need to protect their tracts from a significant vulnerability such as invasive insects or fire threats.

Ability to conserve and consolidate forest patch size in critical areas.

In addressing a plan request backlog or as new opportunities arise to promote the Forest Stewardship Program, service and consultant foresters can build from a core base of forest land. They will be able to identify forest lands of high stewardship potential based either on richness of forest resources or on vulnerabilities, or a combination of the two. They will have enhanced information at their fingertips as they approach and work with forest landowners.

Ability to more effectively allocate staff resources across the landscape.

The results of this project can provide information to State forestry agency managers so they can strategically allocate staff resources throughout the State based on the greatest needs and opportunities. In a similar manner, consultant foresters have the ability to look at project results across the State, and target their professional forestry services accordingly. Further, service foresters working within their assigned areas have the ability to determine high, medium, and low needs and opportunities to help prioritize their efforts.

Project Responsibilities

The Forest Service will:

1. Provide funding as mutually agreed upon by both parties, consistent with FSP guidance.
2. Provide a conceptual design of the project (concept paper) and technical oversight and support.
3. Assume responsibility for developing or adapting a consistent data structure to be used by participating States.
4. Concur with State-developed methodology and standards for digitizing stewardship tract locations.
5. Prepare a final report of participating State results, incorporating previous results from pilot States.

Participating States will:

1. Establish methodology identifying stewardship plan tract location for GIS, determining and mapping components of high-risk and suitability for increased stewardship planning emphasis.
2. Collect and enter historic stewardship implementation data into the database (all plans since 1990, or the best of the State's ability). Database elements to include, at a minimum, those core items listed on page 2 (*tabular database*).
3. Create a historic GIS data layer linked to the database with point data or polygonal data files of all current stewardship tracts.
4. Develop a geo-referenced, spatial dataset (ArcView-Arc/Info compatible) of existing plan location and associated attribute information.
5. Develop common data layers in compliance with those listed in table 1 (page 3).
6. Involve the State Stewardship Coordinating Committee at key decision points throughout project development.
7. Determine the need for additional State-specific data layers (either vulnerabilities or natural resources) and develop them accordingly. Consult the State Stewardship Coordinating Committee concerning the additional data layers.
8. Prepare metadata for spatial data in conformance with minimum Federal metadata standards.
9. Update the electronic stewardship plan database continually beyond project completion. Submit updates to the Forest Service annually or as prescribed.

Participating States and the Forest Service will:

1. Compare stewardship tract location and implementation data with areas identified as fire and forest health risks, areas subject to rapid land use change, priority watersheds, and other factors related to critical-land identification.
2. Complete comparison of stewardship plans and historical action with strategic direction for future plan development.
3. Complete analysis, addressing key questions identified on page 1 (*The Project*).
4. Complete a final report for each State.

Western Forestry Leadership Coalition
Forest Stewardship Project - Spatial Analysis Project / Web-DET Update
Issue Brief #2, September, 2005

SAP; Background: In October, 2004, information on the Spatial Analysis Project was communicated via a Western Forestry Leadership Coalition Issue Brief. Please see http://www.wflccenter.org/infomaterials/issue_briefs.php. All western states and two Pacific Territories have received or requested funding. Seven western states are in full development and nine have statewide assessments (the first step in determining priorities). Please see the map at the end of the paper. A Beta-test meeting was held in Denver April 27-28, 2005 and presentations were given at the following meetings in 2005: SAF Convention, National LOA Meeting, Southern Group of State Foresters, and the Forest Resource Program Leaders.

In addition, the Forest Service Washington Office established a National SAP Steering Committee to develop a strategy for all states to participate.

Web-DET; Current Issue: Now that the western states are either in full development or have statewide assessments, a mechanism is needed to report accomplishments on a continual basis to ensure ongoing strategic program delivery. That mechanism is the Web-Based Data Entry Tool, or Web-DET, the "hand-in-glove", that allows SAP to be a workable, applicable, accountable, and thus sustainable.

Web-DET will automatically store spatial and resource data for individual properties as Forest Stewardship plans are written. Additionally, Web-DET can track other forestry-related activites not necessarily associated with stewardship plans. Web-DET will also serve to remind field foresters and consultants when prescribed management activities are due to be carried out and store accomplishment and resource trend data over time. All of this data will be automatically fed into State, Regional and National databases so that various reporting needs are met on a continuous basis and data is always current. While Web-DET would prescribe to a minimum core set of data and management plan elements for National program and reporting purposes, individual States will be able to add data fields to accommodate unique individual or State standards and requirements. Web-DET will allow states to produce detailed maps and reports of program accomplishments at the district, state, regional, and national levels. This information will be critical to the support of our programs. Security measures have been taken to protect confidential information.

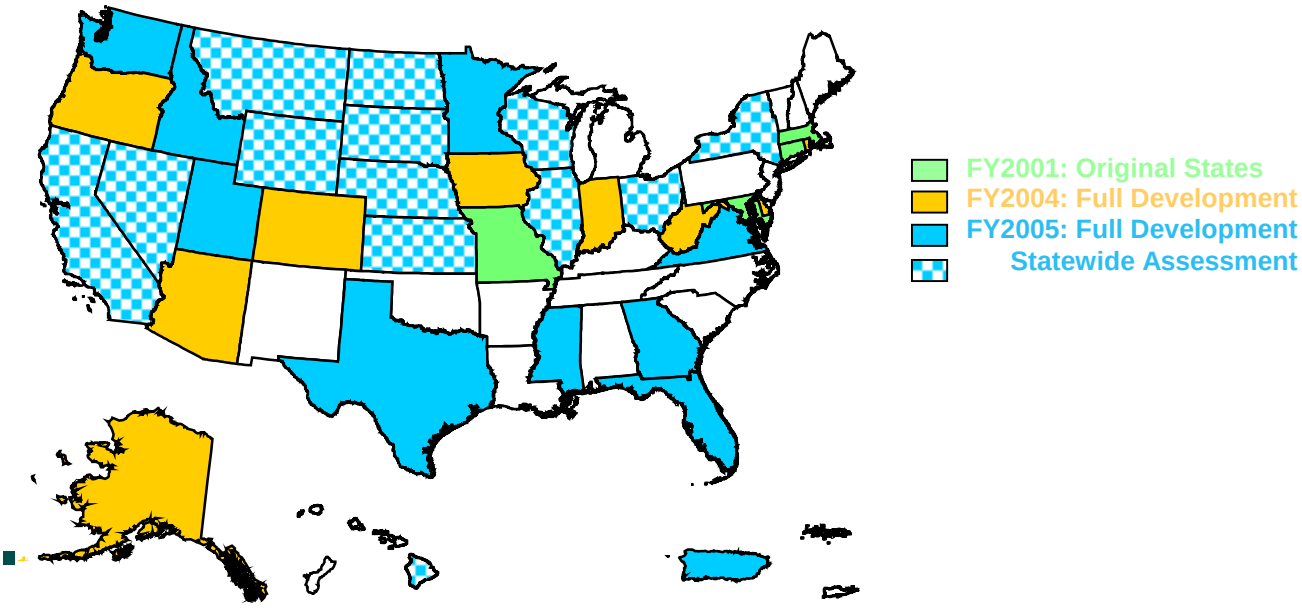
Funding and administration for the development of Web-DET is provided by the US Forest Service as an extension of the Spatial Analysis Project, with project testing being conducted by state and federal GIS and field foresters.

Concerns Addressed: As SAP was developed to identify resource rich forest areas, an issue was raised concerning the Plain States. It was suggested that since 12 core data layers are used to identify areas of high program potential, adding a layer for Agroforestry potential is feasible. The National Agroforestry Center is assisting with this.

Different trainings are needed. It was decided the they be conducted on three levels:
1) informational session for the committee, 2) for those who will train the field staff and 3) training for the field staff.

Key Dates:
August 5, 2005: Regional proposals for 2006 SAP submitted, to be included in 2006 FSP Budget Direction.
January 1, 2006, Phase Roll-out begins. Web-DET online and operational for some states.

Recommendations: Web-DET is still in the development phase and as such, needs input from western states on the use and development of the project. This is the start of a long-term development effort and has the potential to provide new geospatial tools to state forestry agencies. Use of the system is not mandatory, but provides capabilities that states do not currently possess and is expected to have great long-term benefit. There needs to be greater information-sharing about the project and the benefits it can provide to the states. State concerns are welcomed and should be addressed during this development phase. Trainings should continue as well as other avenues for input and discussion.



For more information, contact:
Skip Edel
GIS Program Manager - Colorado State Forest Service
Office: 303.202.4314, Mobile: 303.915.3477, sedel@lamar.colostate.edu

The Forest Stewardship Program
Spatial Analysis Project

Background

According to Forest Service PMAS data, the Forest Stewardship Program (FSP) has provided 238,000 management plans to landowners for the management of more than 27 million acres across the U.S. On the surface these numbers appear impressive but they become less so when we attempt to define what they really mean and how they relate to our core program goal: "…to encourage the long-term stewardship of nonindustrial private forest lands…" How many of these 27 million acres are actually being managed? Where are they? What forest resources are being managed?

Since its inception, the FSP has been delivered by State agency partners to non-industrial private forest owners on a largely first come-first served basis. This customer-friendly approach has benefited many landowners but it is not conducive to the tracking of management impacts nor does it provide for the efficient, strategic use of limited program resources where they will produce the most benefit in terms of important forest landscape features and resource values. Both the Administration and Congress have made it clear that the future of the Forest Stewardship Program will depend upon our ability to track program outcomes, in terms of affected forest resource values on the landscape through time and our ability to strategically direct available program resources.

SAP and Web-DET

The pilot phase of the Spatial Analysis Project (SAP) arose in the Northeastern Area, out of a desire to measure the impact of Forest Stewardship Program on forest resources across the landscape, coupled with a desire to strategically deliver the Forest Stewardship Program in the future. With SAP, the States of Connecticut, Massachusetts, Maryland and Missouri can now spatially display existing Stewardship Plans, and their relationship to important forest and watershed areas. The States of Delaware, Indiana, Iowa, Rhode Island and West Virginia in the Northeast along with Alaska, Oregon and Colorado in the West have begun their SAP efforts this year. State agency personnel from the four pilot States are mentoring the new State participants and the Forest Service has identified regional SAP coordinators.

The Forest Service is also currently working with Colorado State Forest Service and Environmental Systems Research Institute, Inc. (ESRI) to develop a web-based data entry tool (Web-DET) that will automatically store spatial and resource data for individual properties as Forest Stewardship plans are written. Web-DET will also serve to remind field foresters and consultants when prescribed management activities are due to be carried out and store accomplishment and resource trend data over time. All of this data can be automatically fed into State, Regional and National data-bases so that various reporting needs are met on a continuous basis and data is always current. While Web-DET would prescribe to a minimum core set of data and management plan elements for National program and reporting purposes, individual States will be able to add data fields to accommodate unique individual or State standards and requirements.

Key Benefits of SAP and Web-DET

- Allows States and the Forest Service to graphically illustrate and assess how the FSP is affecting the landscape through time.
- Allows States to identify areas of highest Forest Stewardship potential so that limited resources can be used to produce most program benefit.
- Utilizes and enhances existing State GIS capabilities and can accommodate a variety of related forestry and watershed programs.
- Provides field foresters and consultants with a useful plan writing tool.
- Promotes management plan standard consistency, while automating the collection of data for State and National reporting needs.
- Promotes landowner follow-up assistance and the monitoring on plan implementation accomplishments.
- Allows us to measure and market program outcomes in a way that is acceptable meaningful to Congress and the Administration.
- Protects privacy of landowner information.
- Provides states with an analytical tool to address their current and emerging issues and resource opportunities through FSP and in collaboration with other resource management programs.

Pilot State Comments

"*We intend to use SAP results, from a programmatic perspective, to target programs toward those areas of greatest potential benefit*". **Fred Borman**, CT

"*We have incorporated [SAP] into our reporting system to demonstrate to our Commission where the work is getting done and where the funds are being invested"*. **Bob Krepps**, MO

"Without these maps, we couldn't even begin to ponder our future and current policy. The SAP has given us a tool to analyze resource information in a way we have not been able to do before". **Steve Koehn, MD**

"From a land conservation perspective, [SAP] indicates potential for conserving larger blocks of forest resource, though encouragement of forest planning on private lands". **Jim DiMaio**, MA

State Concerns

- **States vary greatly in how they prioritize and define important forest resources.** During the statewide assessment period, States can add uniquely important forest attributes – or data layers – that respond to or reflect unique State resource values. States can then apply weights to their various forest resource data layer attributes, that reflect state level resource management priorities.
- **How will SAP affect future program funding allocations?** As stated above, the Forest Service is being pressed to tie budgets and funding allocation factors to defined resource target areas and management outcomes. Through SAP, we can work with our State partners to accomplish this in a way that accounts for the unique resource management priorities and needs of each State while minimizing accomplishment tracking and reporting burdens. The Forest Service does not intend to use SAP to define National priorities for the purpose of allocating funds.
- **Strategic program delivery approach will exclude some tax paying forest owners who need assistance**. SAP is not intended to result in landowners being turned away. It will, however, allow States to identify high potential areas where outreach efforts and limited resources can achieve the greatest public benefit. States can also use SAP to strategically address landowner request backlogs.
- **How will landowner identity and privacy be protected?** The Forest Service will not have access to individual landowner particulars such as name, address and telephone number. Relevant SAP data related to accomplishments and forest resource attributes will be tied to unique case file identifier numbers. Landowner privacy will thus be protected and SAP data will not be subject to the Freedom of Information Act (FOIA).

Proposed Action Plan

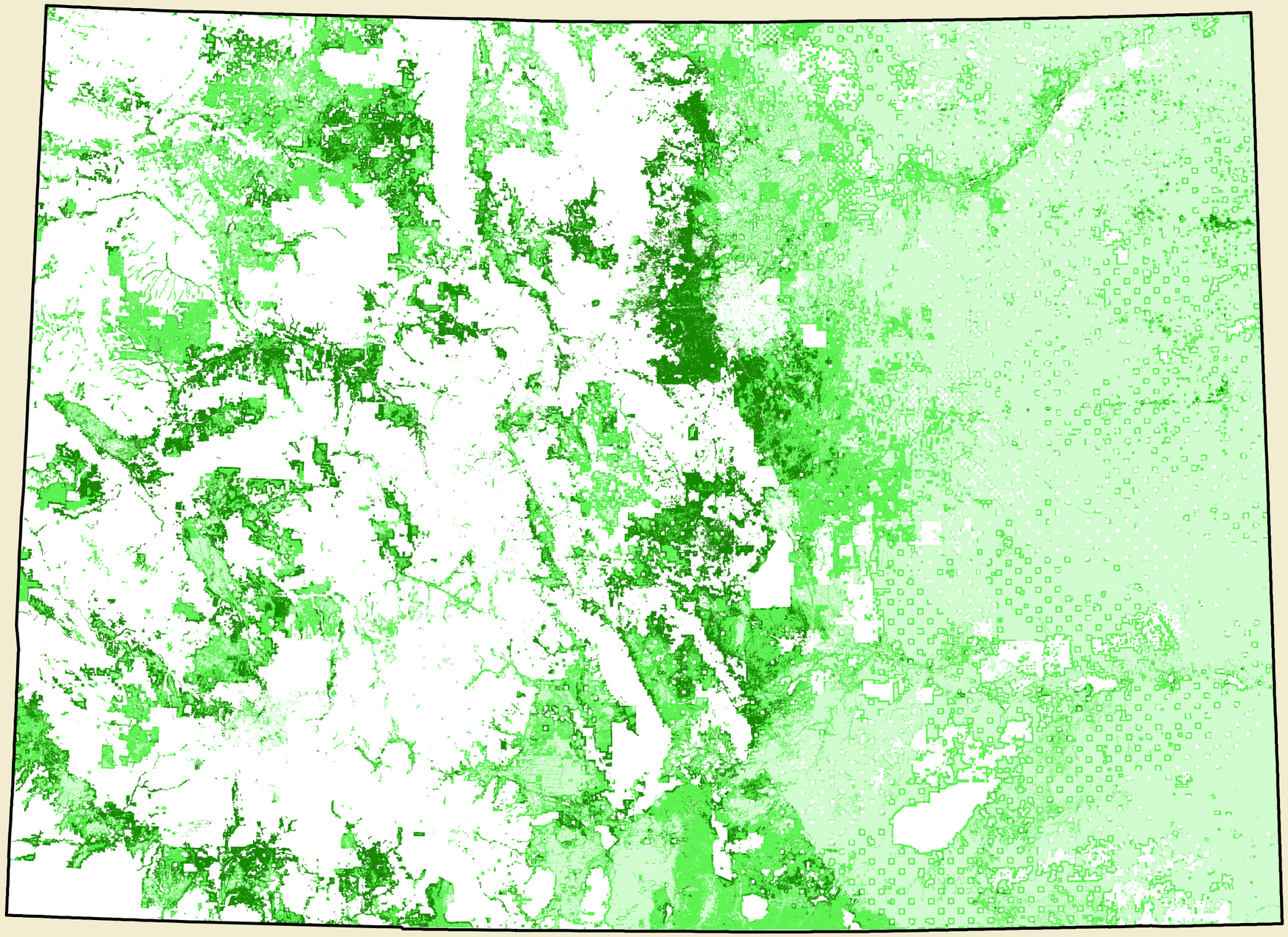
It is important that we invest now in the expansion SAP so that we can work with our State partners to strategically deliver program assistance, while illustrating and tracking program outcomes in a meaningful and consistent manner. The Office of Management and Budget (OMB) is currently evaluating all programs through its Program Assessment Rating Tool (PART) process that focuses on an agency's ability define and track intended program outcomes. In its Credibility through Accountability (CTA) initiative, the Forest Service is developing program specific business plans that attempt to define program outcomes and tie them to budgets and funding allocations. The timely expansion of the SAP to address these pressing program accountability needs will require National and regional coordination and investment. The Washington Office proposes the establishment of a National SAP Steering Committee that will develop a feasible, tactical strategy and budget for getting all States on board with SAP within a reasonable period of time.

The Alternative

Many argue that SAP is expensive and that its development will divert funding support from already tight State service forestry budgets. However, the cost of not investing in SAP will ultimately be much higher if one takes into account the reductions in program funding levels that have resulted from unfavorable OMB PART evaluations, and which are likely, given our current inability to assess program outcomes in a meaningful, consistent way. SAP is the only tool we have for addressing this situation in a timely, effective manner.

Appendix F: Final Maps

1



Potential for Forest Stewardship Program Benefits for Colorado

Stewardship Potential

- Low
- Medium
- High
- Areas without Stewardship Potential

N

20 10 0 20 40 60 Miles

Colorado State Forest Service

Jeff Jahnke, State Forester
Jan Hackett, Stewardship Coordinator

Weighting Scheme by Layer:

15%	Wildfire Hazard
12%	Private Forested
12%	Insect & Disease
12%	Public Drinking Water Sources
10%	Change in Housing Density
8%	Proximity to Public Lands
6%	Agroforestry
6%	T & E Species
5%	Forest Patch Size
5%	Slope
3%	Forested Wetlands
3%	Priority Watersheds
4%	River Riparian Areas

Colorado State Forest Service

MAP NOTES:

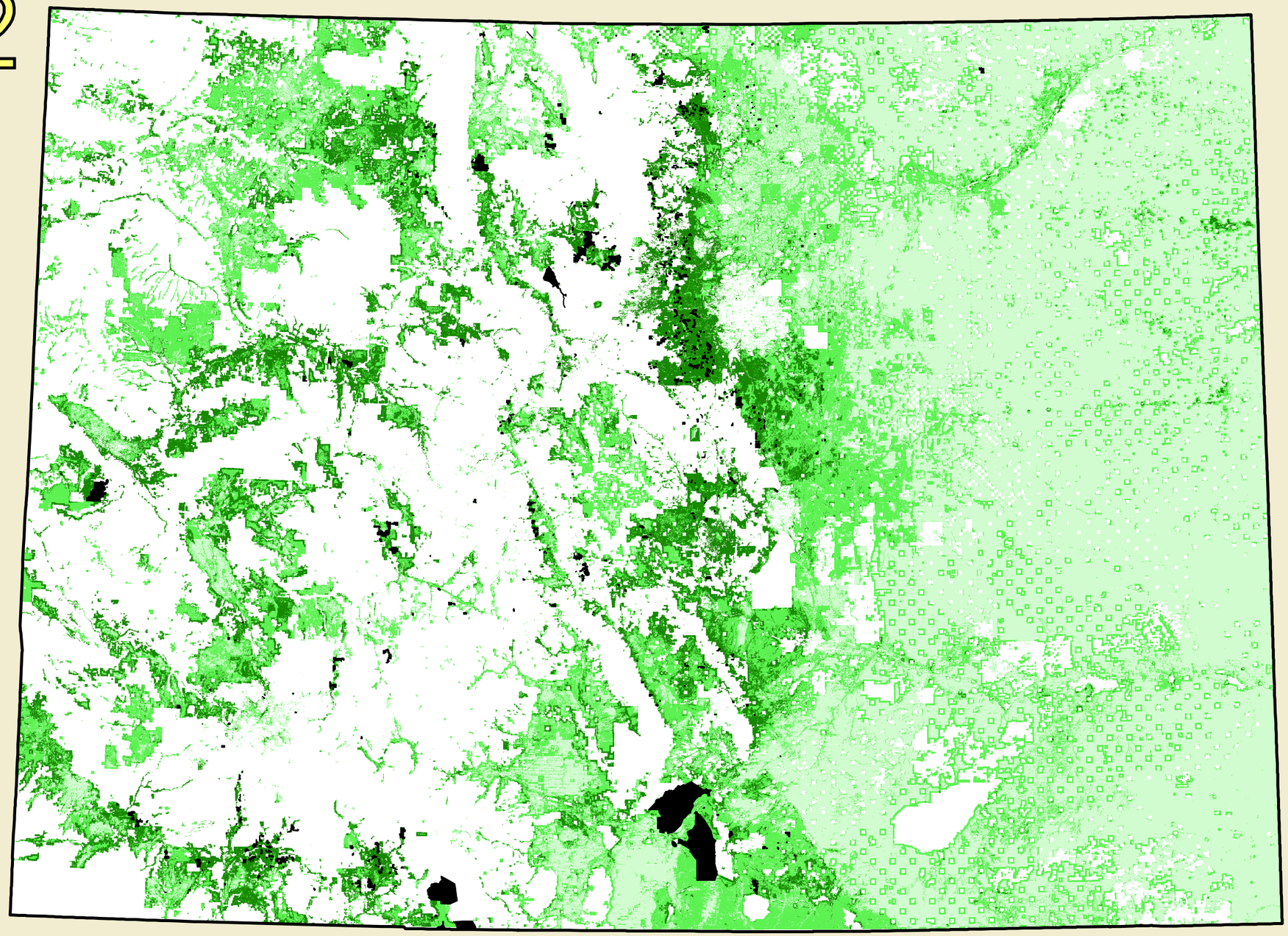
Date: December 2005
Datalayer: stewpotential
File name: Analysis_Map1.mxd
Map by: Jacob Frost,
GIS Technician, CSFS

CONTACT INFORMATION:

Jacob Frost, GIS Technician,
Colorado State Forest Service,
Box 25046, MS 516,
Denver Federal Center, Bldg 810,
Denver, CO 80225
frosty@lamar.colostate.edu

Stewardship Potential	Stewardship Capable Lands					
	Forest		Non-Forest		*Total*	
	Acres	% of total For.	Acres	% of total non-For.	Acres	*% of Total*
High	4,720,447	49%	858,443	3%	5,578,890	*15%*
Medium	4,784,200	50%	7,386,710	26%	12,170,910	*32%*
Low	89,081	1%	19,820,786	71%	19,909,867	*53%*
Total:	*9,593,728*		*28,065,939*		*37,659,667*	

2



Potential for Forest Stewardship Program Benefits for Colorado

and Existing Stewardship Plans

Stewardship Potential

- Low
- Medium
- High
- Stewardship Plans
- Areas without Stewardship potential

N

20 10 0 20 40 60 Miles

Colorado State Forest Service

Jeff Jahnke, State Forester
Jan Hackett, Stewardship Coordinator

Colorado State Forest Service

MAP NOTES:

Date: December 2005
Datalayer: stewpotential
File name: Analysis_Map2.mxd
Map by: Jacob Frost,
GIS Technician, CSFS

CONTACT INFORMATION:

Jacob Frost, GIS Technician,
Colorado State Forest Service,
Box 25046, MS 516,
Denver Federal Center, Bldg 810,
Denver, CO 80225
frosty@lamar.colostate.edu

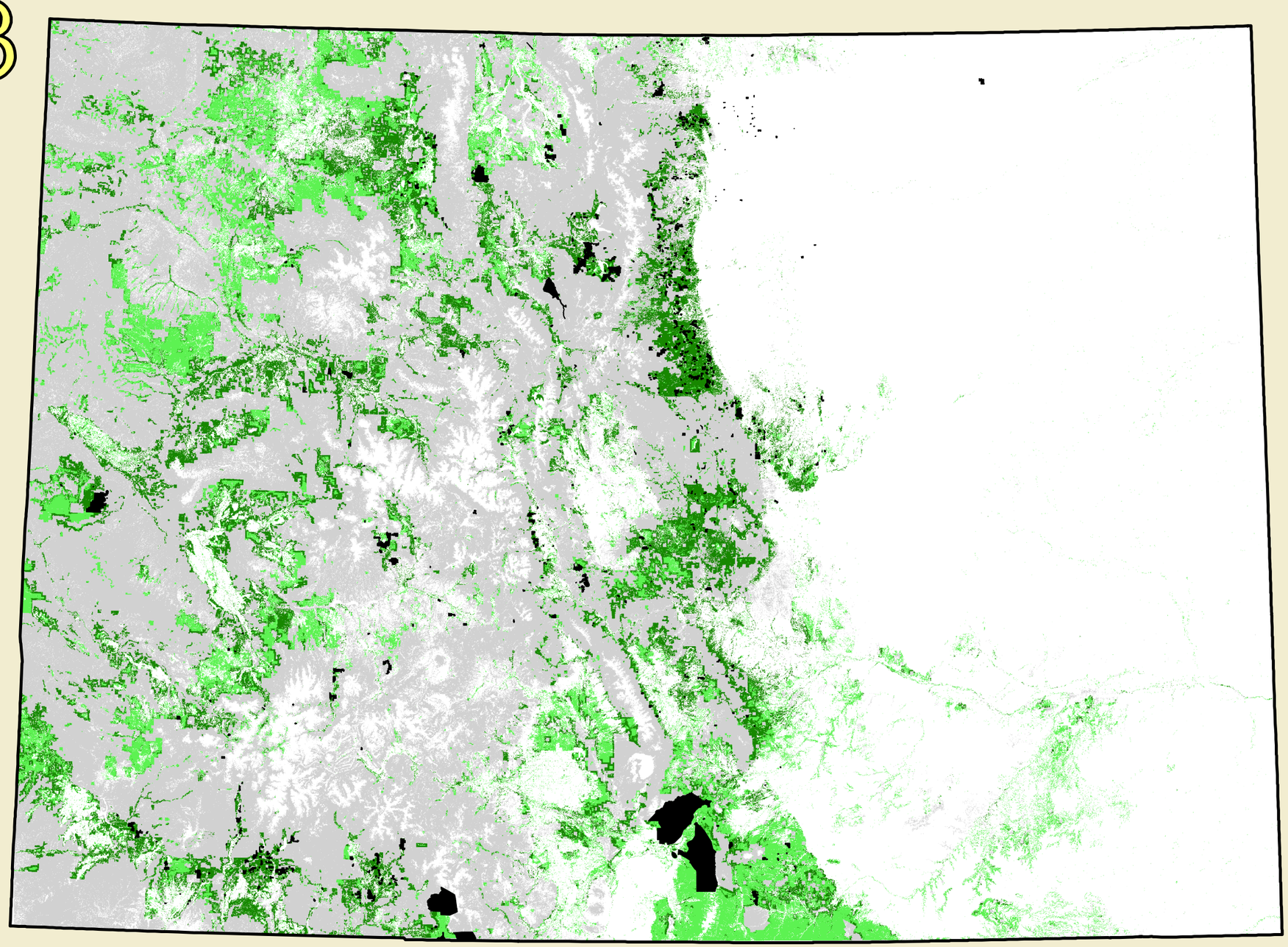
	Stewardship Potential			*Total:*
	Low	Medium	High	
Acres Capable of Stewardship:	19,909,867	12,170,910	5,578,890	37,659,667
Stewardship Plan (acres):	41,902	216,733	153,230	411,865
Stew.Plan vs. Acres Capable of Stewardship (%):	0.2%	1.8%	2.7%	1.1%

Stewardship Potential	Stewardship Capable Lands					
	Forest		Non-Forest		*Total*	
	Acres	% of total For.	Acres	% of total non-For.	Acres	*% of Total*
High	4,720,447	49%	858,443	3%	5,578,890	*15%*
Medium	4,784,200	50%	7,386,710	26%	12,170,910	*32%*
Low	89,081	1%	19,820,786	71%	19,909,867	*53%*
Total:	*9,593,728*		*28,065,939*		*37,659,667*	

3

Forest Stewardship Potential on Private Forest Lands*

and Existing Stewardship Plans for Colorado



Stewardship Potential

- Low
- Medium
- High
- Stewardship Plans
- Non-Forest
- All-Forests*

N

25 12.5 0 25 50 75 Miles

Colorado State Forest Service

Jeff Jahnke, State Forester
Jan Hackett, Stewardship Coordinator

MAP NOTES:

Date: December 2005
Datalayer: stewpotandpf
File name: Analysis_Map3.mxd
Map by: Jacob Frost,
GIS Technician, CSFS

CONTACT INFORMATION:

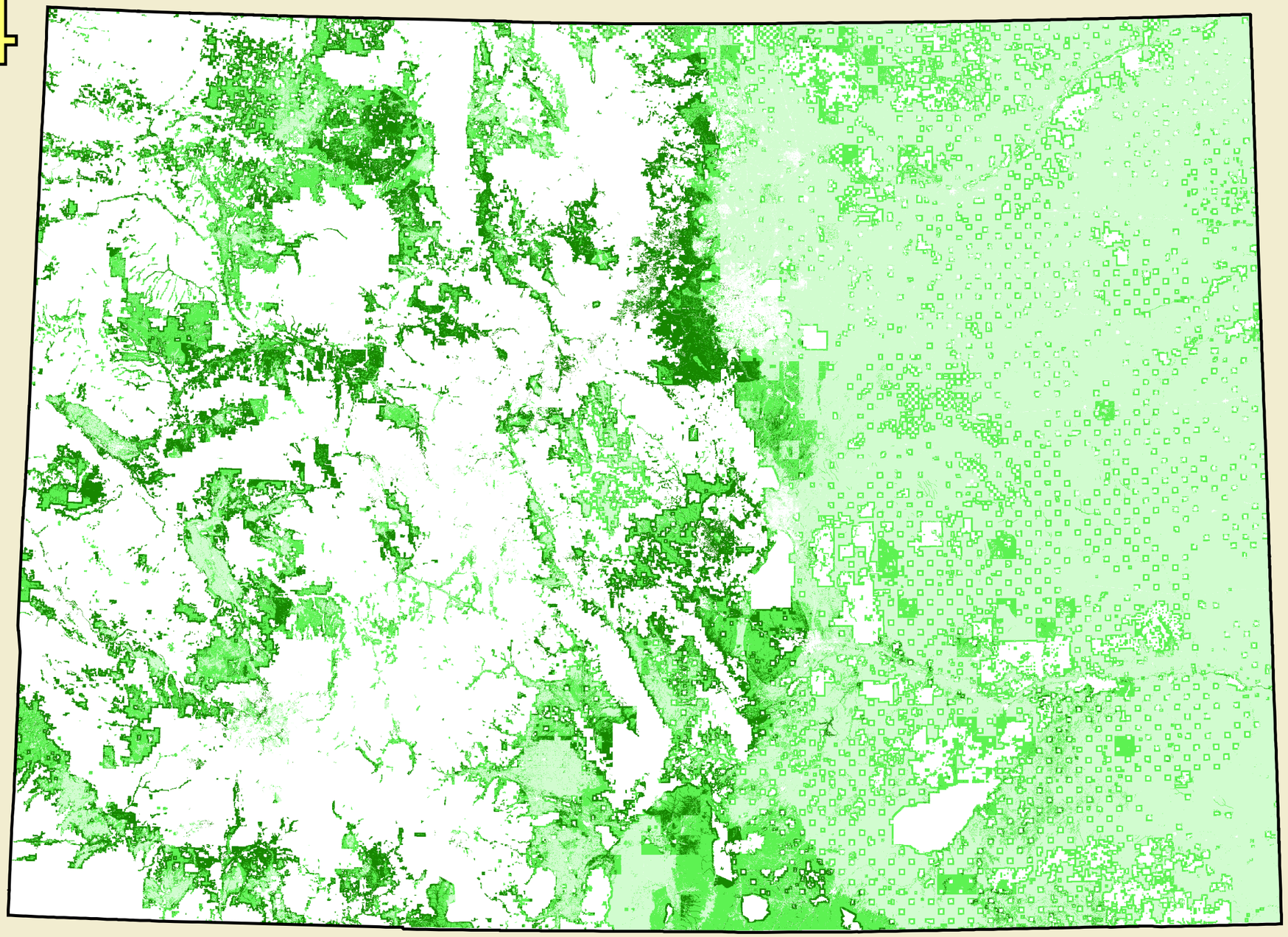
Jacob Frost, GIS Technician,
Colorado State Forest Service,
Box 25046, MS 516,
Denver Federal Center, Bldg 810,
Denver, CO 80225
frosty@lamar.colostate.edu

	Private Forest Lands Stewardship Potential			*Total:*
	Low	Medium	High	
Acres Capable of Stewardship:	89,081	4,784,200	4,720,447	*9,593,728*
Stewardship Plan (acres):	4,826	194,620	146,163	*345,608*
Stewardship Plan acres as a % of Private Forests:	5.4%	4.1%	3.1%	*3.6%*

*** Includes Classes of Land Cover (MRLC):**

41 (Deciduous Forest)
42 (Evergreen Forest)
43 (Mixed Forest)
51 (Shrubland)
61 (Orchards/Vineyards/Other)
91 (Woody Wetlands)

4



Resource Richness*

Colorado

Resource Richness

- Low
- Medium
- High
- Areas Without Stewardship Potentail
- Non-Mask, Non-Resource

N

20 10 0 20 40 60 Miles

Colorado State Forest Service

Jeff Jahnke, State Forester
Jan Hackett, Stewardship Coordinator

Colorado State Forest Service

MAP NOTES:

Date: December 2005
Datalayer: resource_rich
File name: Analysis_Map4.mxd
Map by: Jacob Frost,
GIS Technician, CSFS

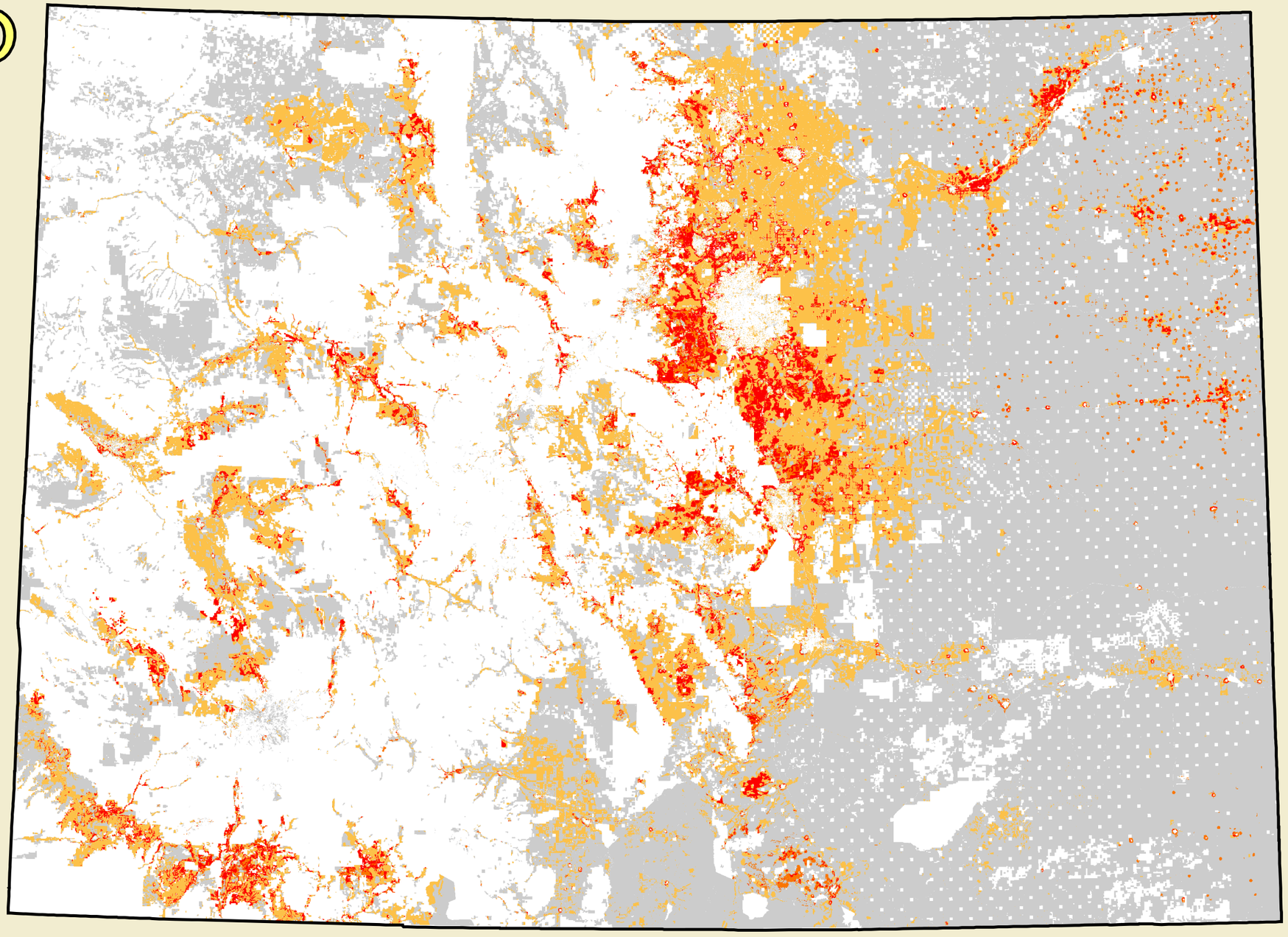
CONTACT INFORMATION:

Jacob Frost, GIS Technician,
Colorado State Forest Service,
Box 25046, MS 516,
Denver Federal Center, Bldg 810,
Denver, CO 80225
frosty@lamar.colostate.edu

*** Includes Data Themes:**

- **Private Forest Lands**
- **Forest Patches**
- **Proximity to Public/Protected Lands**
- **Forested Wetlands**
- **Riparian Areas**
- **Public Water Supplies**
- **Slope**
- **Priority Watersheds**
- **Threatened and Endangered Species**
- **Agroforestry**

5



Resource Threats*

Colorado

Resource Threats

- Low
- Medium
- High
- Areas Without Stewardship Potential
- Non-Mask, Non-Threat

N

20 10 0 20 40 60 Miles

Colorado State Forest Service

Jeff Jahnke, State Forester
Jan Hackett, Stewardship Coordinator

*** Includes Data Themes:**
Wildfire Assessment
Change in Households
Forest Pests

Colorado State Forest Service

MAP NOTES:

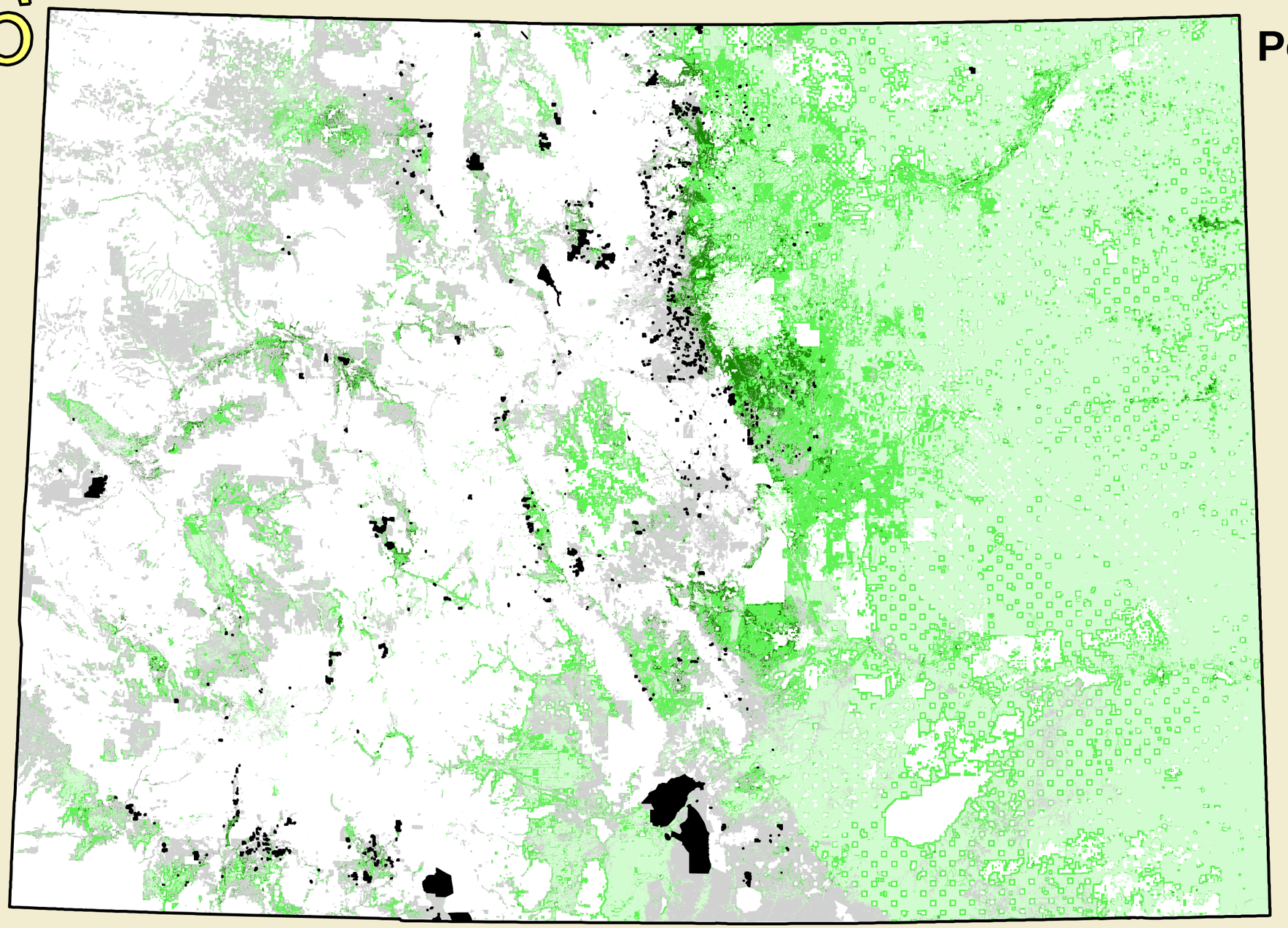
Date: December 2005
Datalayer: resource_thrt
File name: Analysis_Map5.mxd
Map by: Jacob Frost,
GIS Technician, CSFS

CONTACT INFORMATION:

Jacob Frost, GIS Technician,
Colorado State Forest Service,
Box 25046, MS 516,
Denver Federal Center, Bldg 810,
Denver, CO 80225
frosty@lamar.colostate.edu

6

Forest Stewardship Potential on Non-Forested - Non-Developed* and Existing Stewardship Plans for Colorado



Stewardship Potential

- Low
- Medium
- High
- Stewardship Plans
- Areas Without Stewardship Potential
- Private Forest*

N

20 10 0 20 40 60 Miles

Colorado State Forest Service

Jeff Jahnke, State Forester
Jan Hackett, Stewardship Coordinator

*** Includes Classes of Land Cover (MRLC):**

31 (Bare Rock/Sand/Clay)
33 (Transitional)
71 (Grasslands/Herbaceous)
81 (Pasture/Hay)
82 (Row Crops)
83 (Small Grains)
84 (Fallow)
85 (Urbans/Recreational Grasses)
92 (Emergent Herbaceous Wetlands)

Colorado State Forest Service

MAP NOTES:

Date: December 2005
Datalayer: stewpotonnfnd
File name: Analysis_Map6.mxd
Map by: Jacob Frost,
GIS Technician, CSFS

CONTACT INFORMATION:

Jacob Frost, GIS Technician,
Colorado State Forest Service,
Box 25046, MS 516,
Denver Federal Center, Bldg 810,
Denver, CO 80225
frosty@lamar.colostate.edu

	Non-Forest - Non-Developed Lands Stewardship Potential			*Total:*
	Low	Medium	High	
Acres Capable of Stewardship:	19,777,543	7,331,358	841,541	*27,950,442*
Stewardship Plan (acres):	36,604	20,416	8,510	*65,530*
Stewardship Plan acres as a % of Non-for-Non-devpd:	0.18%	0.28%	1%	*0.23%*

7

GILPIN

CLEAR CREEK

JEFFERSON

PARK

ADAMS

ARAPAHOE

DOUGLAS

ELBERT

DENVER

Arvada

Wheat Ridge

Golden

Denver

Lakewood

Commerce City

Aurora

Englewood

Sheridan

Cherry Hills Village

Greenwood Village

Littleton

Centennial

Lone Tree

Parker

Castle Rock

93 46 119 58 76 270 70 25 36 6 40 225 83 103 470 74 285 105 86

Forest Stewardship Potential on Private Forests vs. Non-Forest and Existing Stewardship Plans for Colorado (Denver Area)

N

Stewardship Potential for:

Private Forest	Non-Forest	Other Map Items:
Low	Low	Stewardship Plans
Medium	Medium	Areas Without Stewardship Potential
High	High	Municipal Boundaries

MAP NOTES:

Date: December 2005
Datalayer: stewpotandpf/ stewpotonnfnd
File name: Analysis_Map7.mxd
Map by: Jacob Frost, GIS Technician, CSFS

CONTACT INFORMATION:

Jacob Frost, GIS Technician,
Colorado State Forest Service,
Box 25046, MS 516,
Denver Federal Center, Bldg 810,
Denver, CO 80225
frosty@lamar.colostate.edu

2 1 0 2 4 6 Miles

Appendix G: DVD Contents