USDA United States Department of Agriculture

Forest Service

Locational business intelligence in the U.S. Forest Service:

Geospatial Accomplishment Reporting

ESRI USER CONFERENCE 2015

JULY 21, 2015

Agenda

Introduction to the US Forest Service

Why geo-Enable Performance Data?

Data Design for gPAS (geo-enabled Performance Accountability System)

Business Intelligence Reporting

Project Challenges

Summary

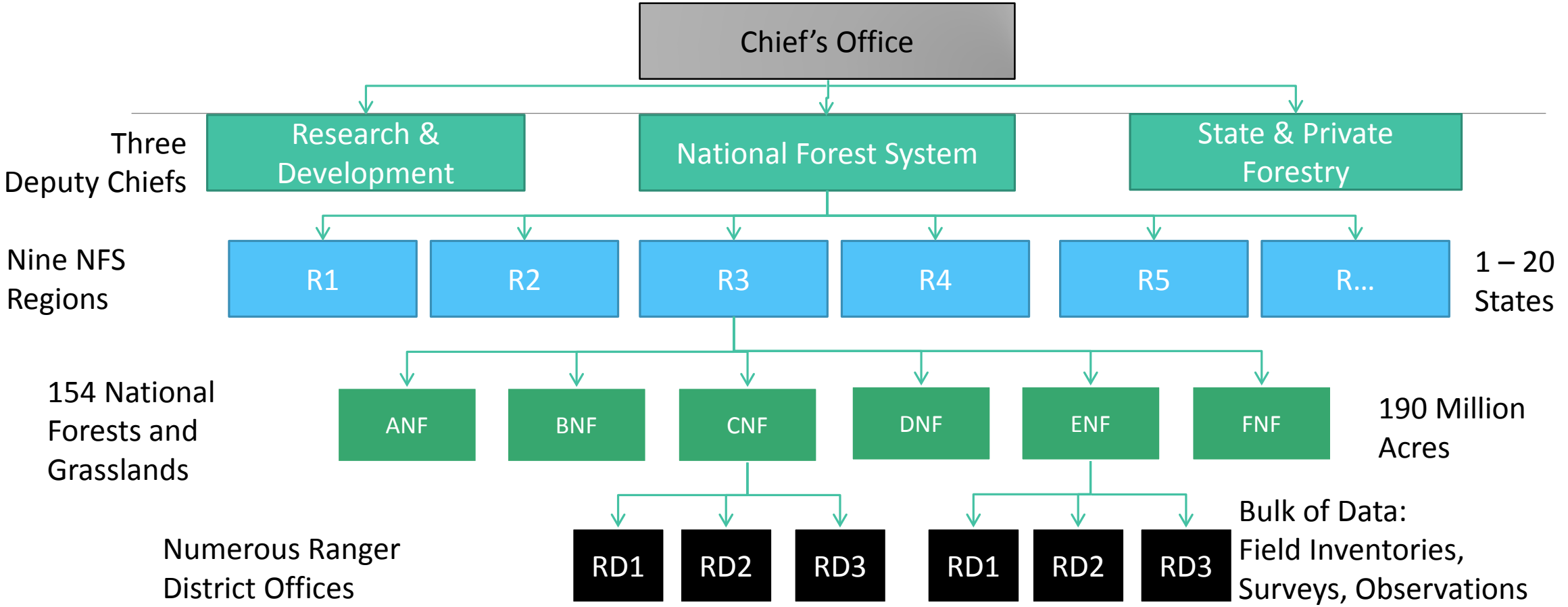
Questions

Introduction to the Forest Service

National Forest boundaries

The US Forest Service manages and protects 154 national forests and 20 grasslands in 44 states and Puerto Rico. The agency's mission is to sustain the health, diversity, and productivity of the nation's forests and grasslands to meet the needs of present and future generations.

National Forests in Alaska (not to scale)



US Forest Service Units Participating in gPAS

Forest Service by the numbers

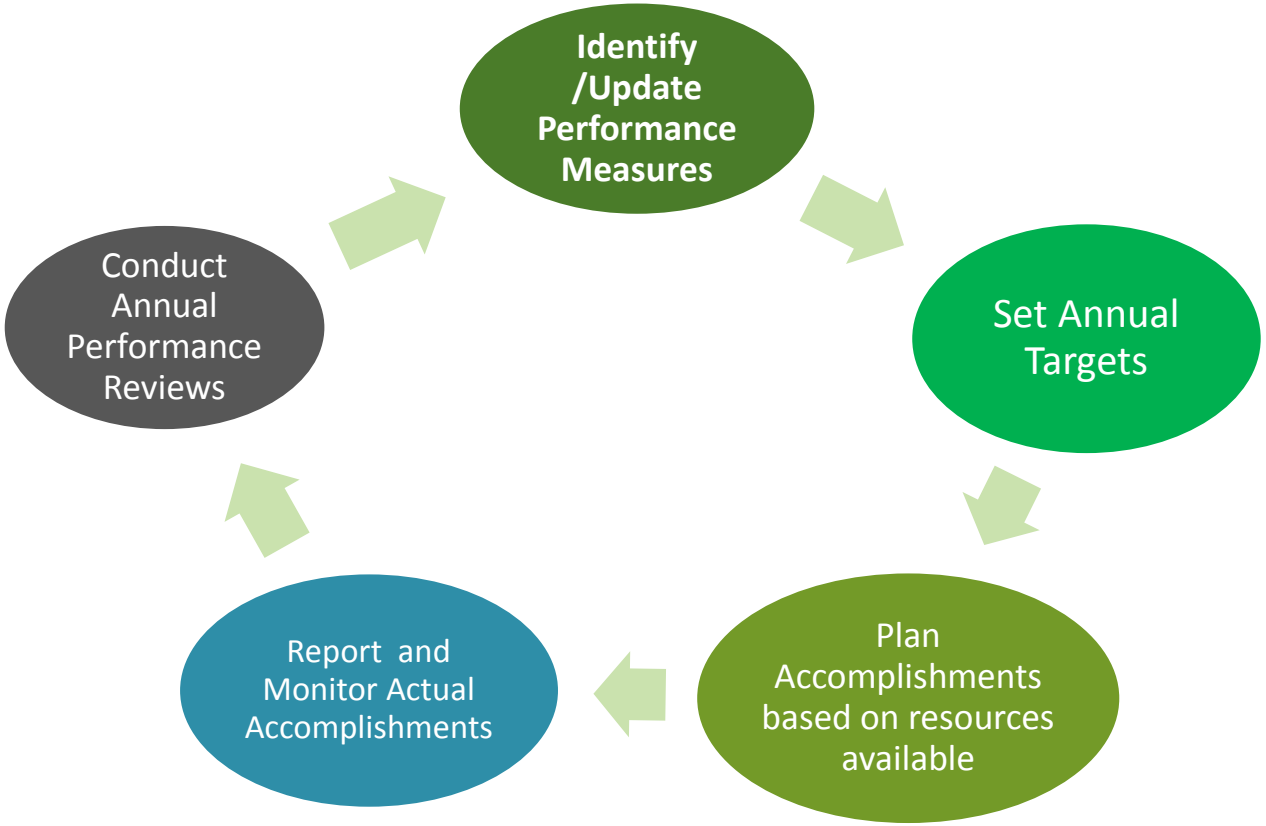
- 193 million acres
- 154 national forests
- 20 national grasslands
- 1 Tall Grass Prairie
- 9 national monuments
- 5.75 million acres of wilderness
- 57,000 miles of streams
- 9,100 miles of Scenic Byways
- 4,400 miles of Wild and Scenic Rivers
- 277,000 heritage sites
- 4,300 campgrounds
- 122 ski areas
- 158,000 miles of trails
- 371,000 miles of roads
- 40,000 buildings
- 27,000 recreation sites
- 17,000 vehicles
- 13,000 bridges
- 1700 dams

Why Geo-Enable FS Performance Management?

Spatial context allows the Forest Service to:

- Improve our performance reporting
  - Where we do things is as important as how much we do
  - What is measured is what gets done…including data
- Better tell our story
  - Provides visualization of complex relationships
  - Maps enhance tables of accomplishment numbers
  - Maps show where the budget is spent
- Better meet the needs of our stakeholders
  - Report accomplishments by
    - Forest Service Administrative boundaries
    - Political boundaries
    - Natural boundaries
- Integrating data across units and business areas
  - Makes data more useable and accessible internally and externally
  - Standardizes data and brings it together in one place

Forest Service Performance Management Cycle



Sample Legacy System Tabular Performance Report

Strategic Measure Accomplishments

Target compared to plan and actual accomplishments

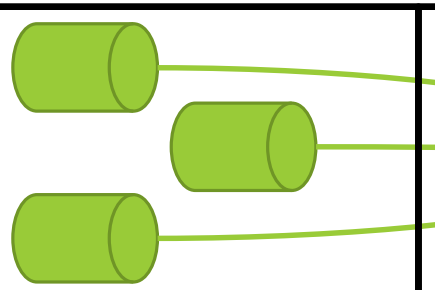
Measures

Accomplishment Codes	2014 Assigned Target	2014 Planned in Approved WorkPlans	2014 YTD Actual Accomplishment	2014 Percent of Target Completed
Acres treated to reduce the risk of catastrophic wildfire	1,600,000.0	1,030,218.0	2,542,321.1	158.9
Acres of lake habitat restored/enhanced	26,000.0	24,508.1	30,721.9	118.2
Miles of stream habitat restored or enhanced	3,262.0	2,959.6	3,488.4	106.9
Acres of terrestrial habitat restored/enhanced	2,700,000.0	2,463,499.7	2,778,396.3	102.9
Acres of forestland vegetation improved	232,000.0	222,721.4	260,518.4	112.3
Acres of forest vegetation established	204,000.0	158,203.2	175,187.9	85.9
CCF of Timber Volume Sold	5,600,000.0	4,810,193.5	5,353,196.4	95.6
Green tons of biomass for bio-energy	2,300,000.0	356,002.2	2,156,323.5	93.8
% of recreation sites maintained to standard	69.0	0.0	77.2	111.8
Number of recreation sites maintained to standard	11,570.0	9,500.8	13,262.0	114.6
% of passngr car roads operatng at ML 3, 4, or 5	88.0	0.0	89.5	101.7
NFS lands covered by travel mgmt implementation plans	192,920,777.0	170,887,170.9	167,980,459.9	87.1
% of admin facilities maintained to standard	58.0	0.0	60.8	104.9
Administrative facilities maintained to standard	9,071.0	7,499.0	9,998.0	110.2

Data Design for gPAS

GEO-ENABLED PERFORMANCE ACCOUNTABILITY SYSTEM

Enterprise Data Warehouse – the FS BI Architecture

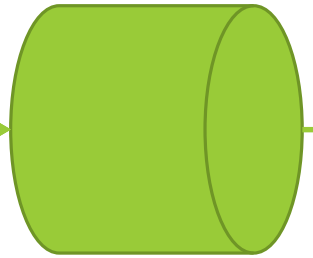


Source Systems:

- Transactional Source Systems

Extract, Transform, Load:

- FME
- Informatica



Data Warehouse (EDW):

- Oracle
- ArcSDE
- Dimensional Model

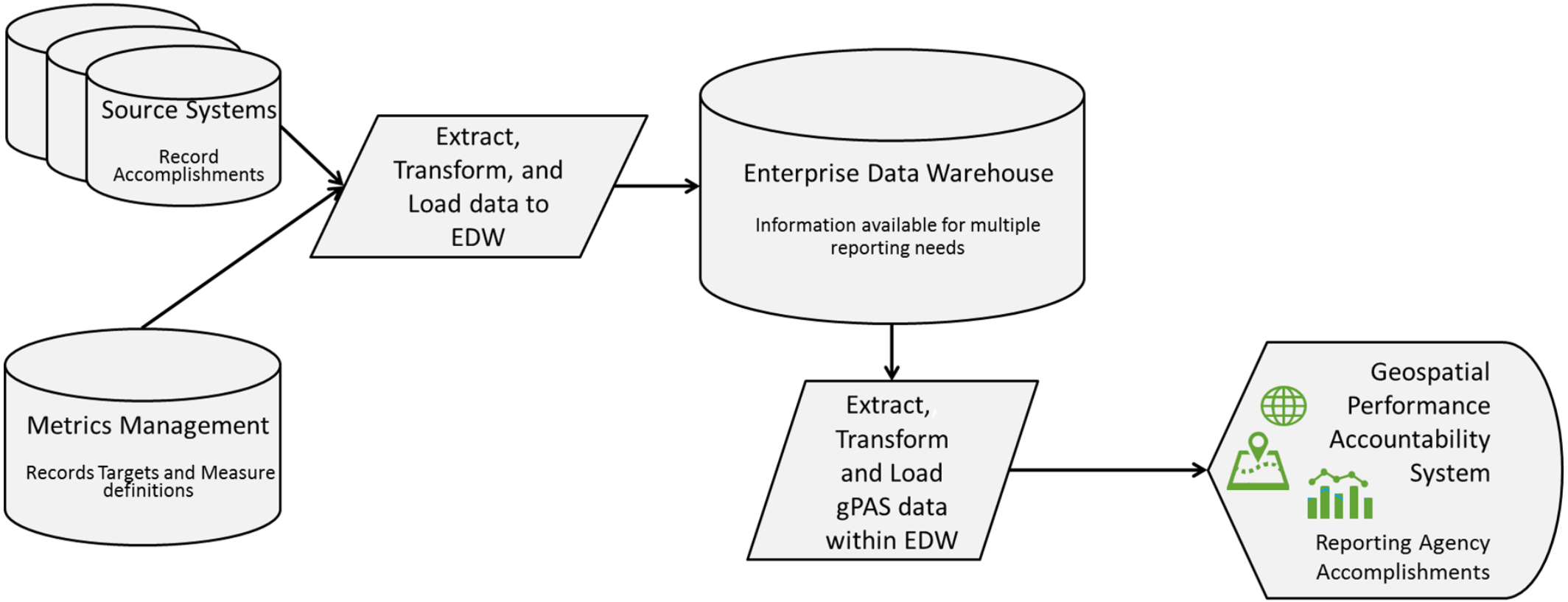
Map Services:

- ArcGIS Server

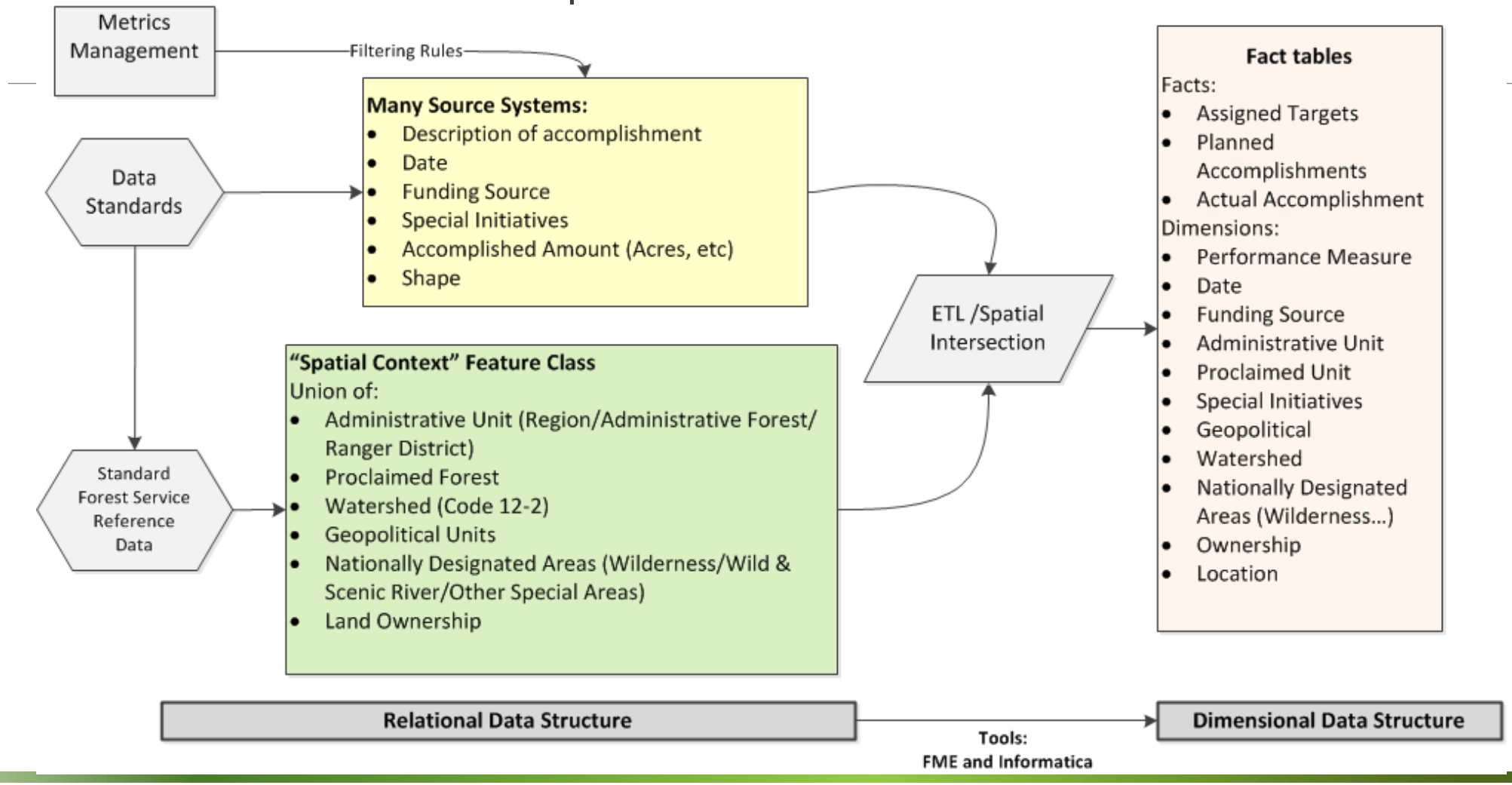
Reporting:

- IBM Cognos
- ESRI Maps for Cognos
- ArcMap
- ArcGIS On-Line (AGOL)
- Interactive Maps
- Many other formats

gPAS Process Overview



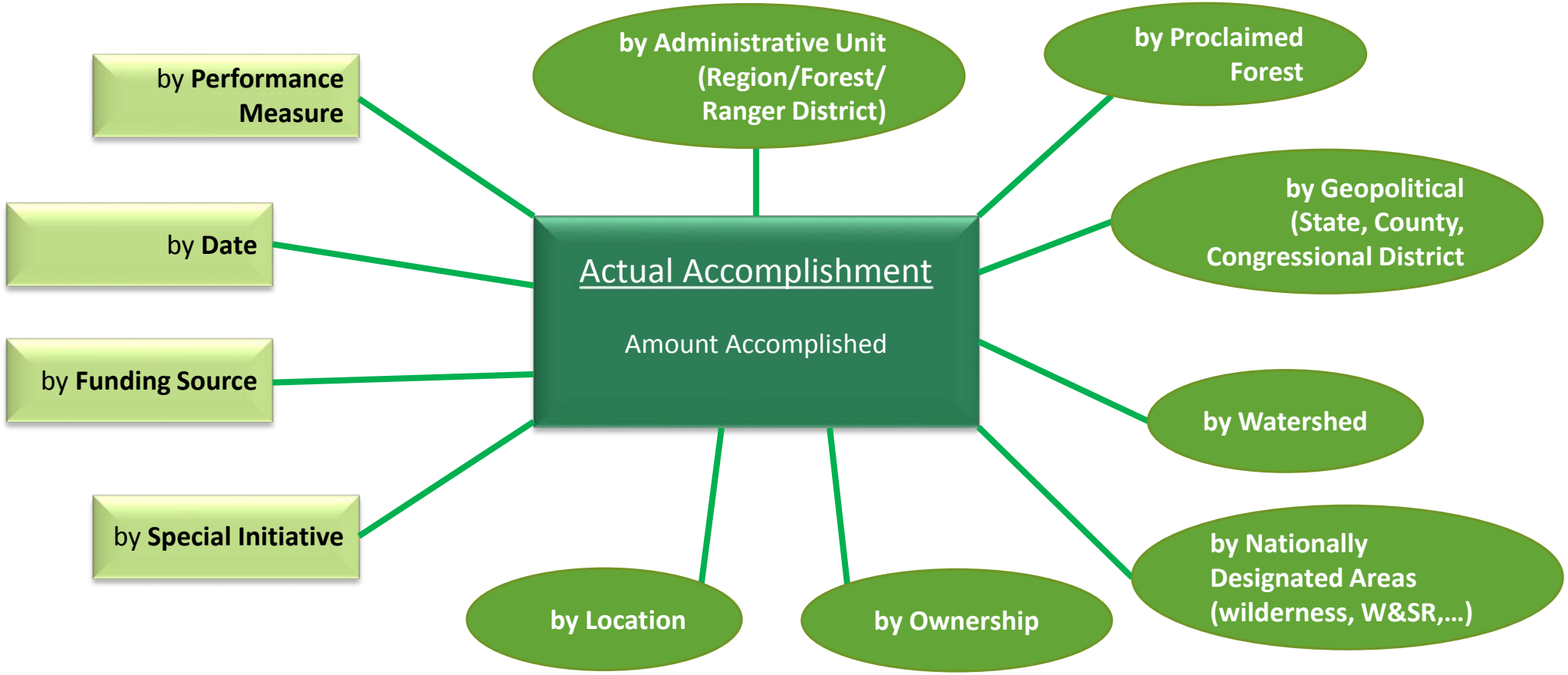
Data Flow: Combine Spatial and Tabular Data



The Dimensional Model

Dimension	Target Star **Amount Assigned**	Planned Accomplishment Star **Amount Planned**	Actual Accomplishment Star **Amount Accomplished**
Performance Measure	☆	☆	☆
Date	☆ Fiscal Year	☆ Fiscal Year	☆ Actual Date
Funding Source		☆	☆
Special Initiatives		☆	☆
Administrative Unit	🌐	🌐	🌐
Proclaimed Unit			🌐
Geopolitical Units			🌐
Nationally Designated Areas			🌐
Watershed			🌐
Land Ownership			🌐
Location			🌐

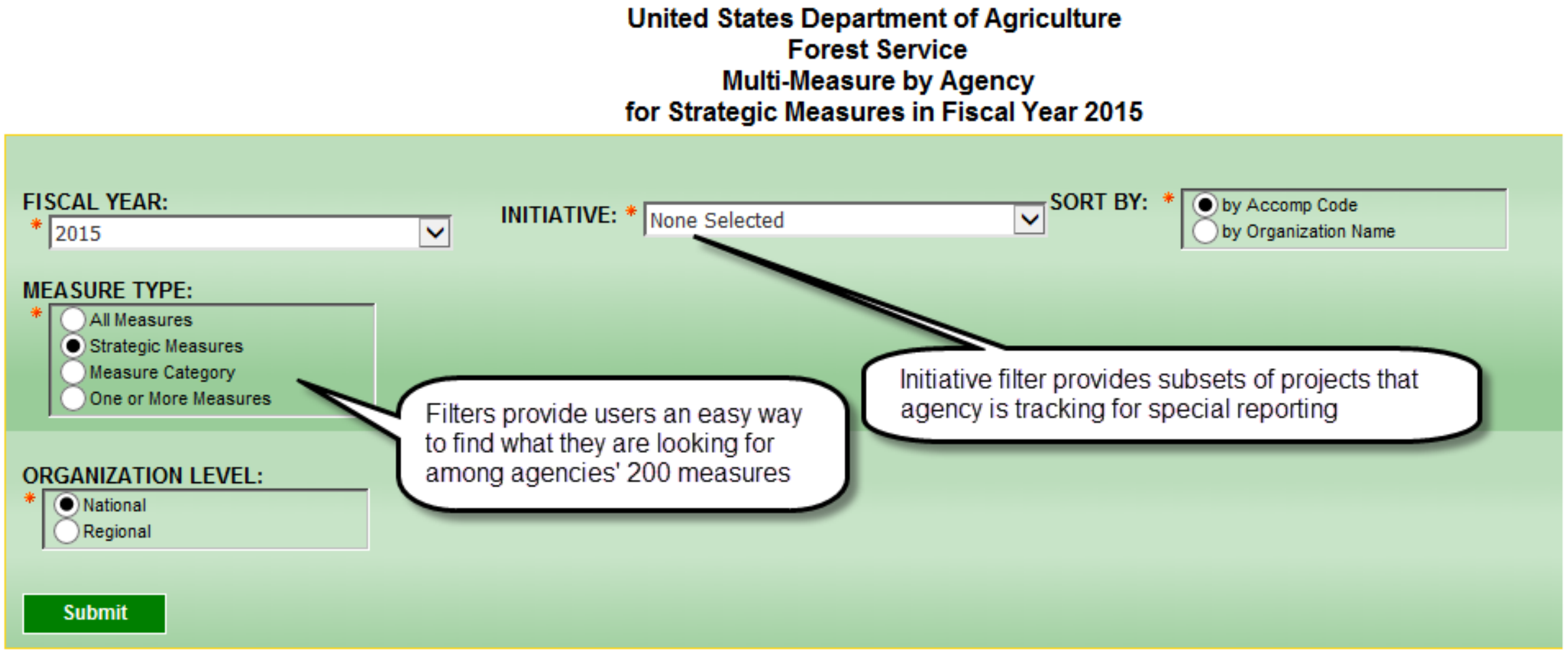
The Actual Accomplishment Star



Business Intelligence Reporting

Business Intelligence Reporting

- Reports are generated using Cognos and ESRI Maps
- Designed to enable users to select Fiscal year, measures, and FS Administrative Units or geographic areas to develop reports to meet their needs
- Tabular and mapped report capabilities

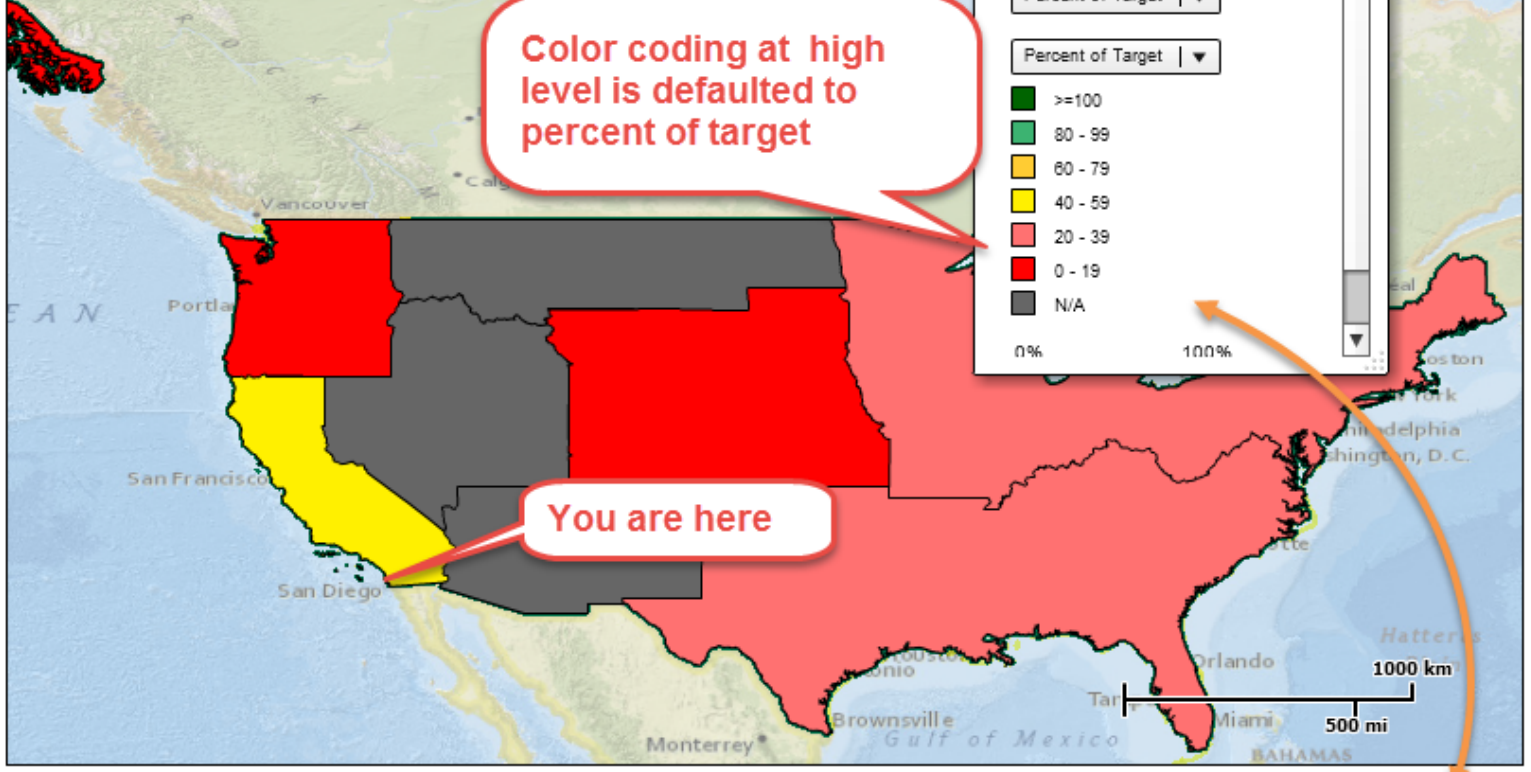


Multiple Measure Report – administrative user's start point

Accomp Code	Accomplishment Name	Actual Accomplished	Planned	Target	Unit of Measure	Percent of Target	Spatial Type
FOR-VEG-EST	Acres of forest vegetation established	52,363	150,917	188,000	ACRE	28%	POLYGON
FOR-VEG-IMP	Acres of forestland vegetation improved	36,888	208,725	235,000		16%	POLYGON
FP-FUELS-NON-WUI	Acres of non-WUI fuels treated					N/A	POLYGON
FP-FUELS-WUI	FS Acres of fuels treated in the WUI					N/A	POLYGON
FP-FUELS-WUI-AC	Acres of fuels treated in the WUI					38%	NONE
FP-FUELS-WUI-ST	SFA Acres of fuels treated in the WUI				ACRE	N/A	NONE
HBT-ENH-LAK	Acres of lake habitat restored/enhanced	100.52	18,313.00	32,000.00	ACRE	0%	POLYGON
HBT-ENH-STRM	Miles of stream habitat restored or enhanced	56.45	2,393.50	3,262.00	MILE	2%	LINE
HBT-ENH-TERR	Acres of terrestrial habitat restored/enhanced	64,369.77	1,920,432.20	2,730,000.00	ACRE	2%	POLYGON
INVPLT-NXWD-FED-AC	Acres treated for noxious weeds/invasive plants on NFS lands	10,099.50	179,599.00	280,000.00	ACRE	4%	POLYGON
LND-PURCH-CUML-AC	Cumulative acres acquired through purchases or donations	370,827	N/A	N/A	ACRE	N/A	NONE
REC-SRVY-SAT	Number of NF visits where visitor was satisfied	139,074,400	N/A	N/A	PEOPLE	N/A	NONE
RG-VEG-IMP	Acres of rangeland vegetation improved	1,895	523,098	0	ACRE	N/A	POLYGON
S&W-RSRC-IMP	Acres of water/soil resources protected/maintained/improved	N/A	203,841	400,000	ACRE	N/A	POLYGON
SP-LGCY-PROT-CUML-AC	Cumulative private acres protected frm conv by legacy prgm	N/A	N/A	2,617,577	ACRE	N/A	NONE
SP-NUM-PPL-ENV-PROG	Participants in FS environmntl literacy progrms/activities	90,958	N/A	6,000,000	PEOPLE	2%	NONE

Clicking on context sensitive hyperlinks will open intuitively relevant reports

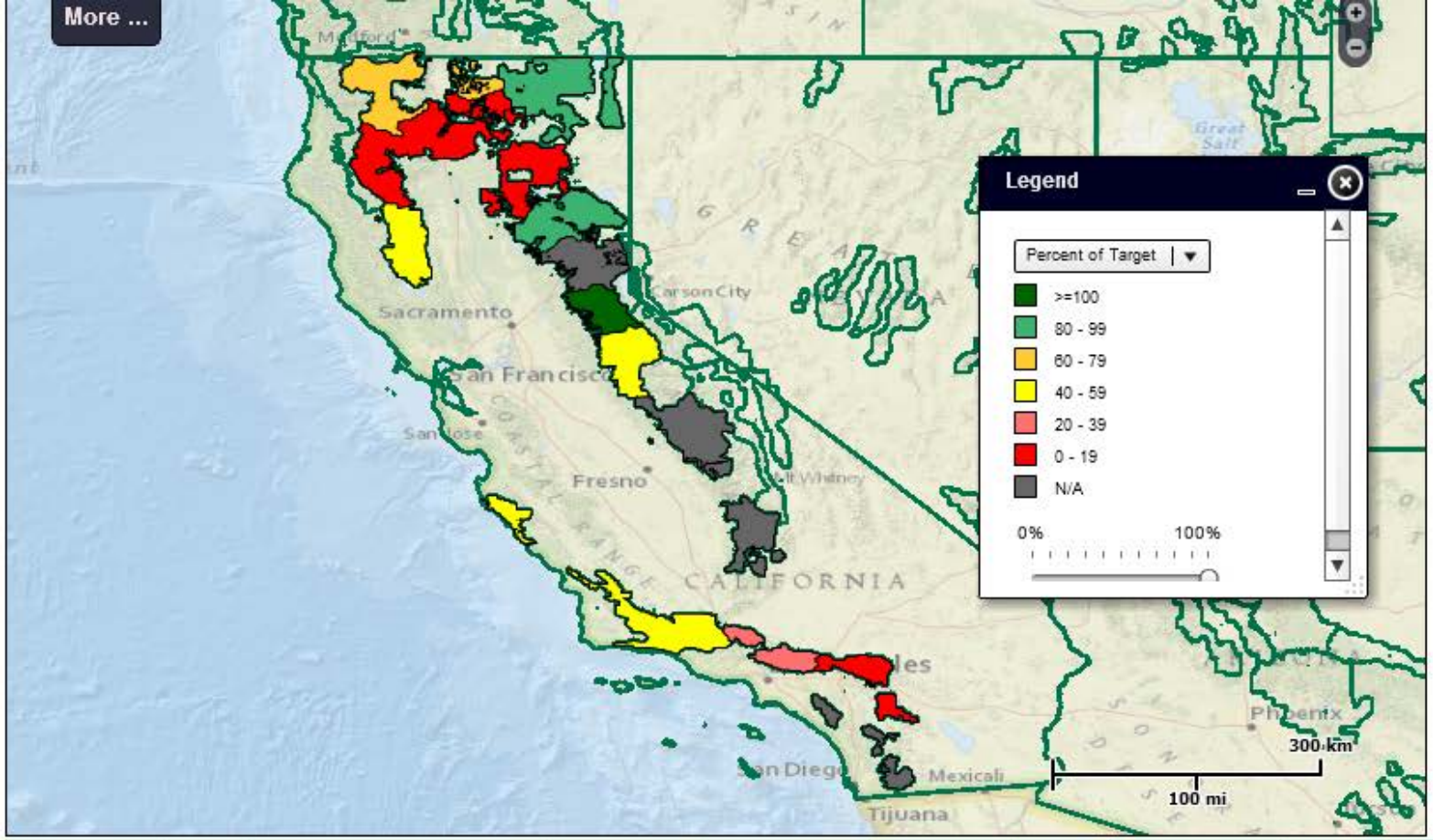
Multiple Measure Report – National Tabular



Accomp Code	R/S/A Code	R/S/A Name	Actual Accomplished	Accomplished with Spatial	Spatial Feature Size	Planned	Target	Unit of Measure	Percent of Target
FOR-VEG-EST	01	NORTHERN REGION	5,968	5,266	5,497	14,519	0	ACRE	N/A
FOR-VEG-EST	02	ROCKY MOUNTAIN REGION						RE	18%
FOR-VEG-EST	03	SOUTHWEST REGION						RE	N/A
FOR-VEG-EST	04	INTERMOUNTAIN REGION						CRE	N/A
FOR-VEG-EST	05	PACIFIC SOUTHWEST REGION	8,910	7,838	7,413	16,569	17,860	ACRE	50%
FOR-VEG-EST	06	PACIFIC NORTHWEST REGION	6,466	5,747	7,383	30,093	35,855	ACRE	18%

Regional Hyperlinks will open Regional reports by forest

National Acres of Forest Vegetation Established By Region



Accomp Code	Admin Unit	Admin Unit Name	Actual Accomplished	Accomplished with Spatial	Spatial Feature Size	Planned	Target Quantity	Unit of Measure	Percent of Target
FOR-VEG-EST	0501	ANGELES	1,425	1,425	1,130	1,627	1,627	ACRE	88%
FOR-VEG-EST	0502	CLEVELAND	N/A	N/A	N/A	0	85	ACRE	N/A
FOR-VEG-EST	0503	ELDORADO	701	589	569	N/A	364	ACRE	193%

National Acres of Forest Vegetation Established for the Pacific Southwest Region

ORGANIZATION LEVEL:

* (•) National
( ) Regional

Submit

Clicking on Accomplishment Code hyperlinks will jump to reports with map turned off

Accomp Code	Accomplishment Name	Actual Accomplished	Planned	Target	Unit of Measure	Percent of Target	Spatial Type
BIO-NRG	Green tons of biomass for bio-energy	1,193,648	226,122	2,500,000	GREEN TONS	48%	NONE
FOR-VEG-EST	Acres of forest vegetation established	52,363	150,917	188,000	ACRE	28%	POLYGON
FOR-VEG-EST-IMP	Acres of forest vegetation established or improved	89,251.7	359,642.7	423,000.0	ACRE	21%	POLYGON
FOR-VEG-IMP	Acres of forestland vegetation improved	36,888	208,725	235,000	ACRE	16%	POLYGON
TMBR-BRSH-DSPSL	Acres of harvest-related woody fuels treated	41,801	28,024	70,000	ACRE	60%	POLYGON
TMBR-SALES-TRT-AC	Acres of forestlands treated using timber sales	66,625	111,346	N/A	ACRE	N/A	NONE
TMBR-TRT	Acres of forestlands treated to achieve healthier conditions	1,779	56,570	N/A	ACRE	N/A	NONE
TMBR-VOL-HVST	CCF of timber volume harvested	2,576,948	646,260	N/A	CCF	N/A	NONE
TMBR-VOL-SLD	CCF of timber volume sold	2,109,074	4,408,626	5,800,000	CCF	36%	NONE

National Multiple Measure Report with FY 2015 Forest Management accomplishments selected

United States Department of Agriculture
Forest Service
Single Measure by Admin Unit for PACIFIC SOUTHWEST REGION
for Acres of forest vegetation established in Fiscal Year 2015

Accomp Code	Admin Unit	Admin Unit Name	Actual Accomplished	Accomplished with Spatial	Spatial Feature Size	Planned	Target Quantity	Unit of Measure	Percent of Target
FOR-VEG-EST	0501	ANGELES	1,425	1,425	1,130	1,627	1,627	ACRE	88%
FOR-VEG-EST	0502	CLEVELAND	N/A	N/A	N/A	0		ACRE	N/A
FOR-VEG-EST	0507	LOS PADRES	500	0	0	1,000	1,000	ACRE	50%
FOR-VEG-EST	0508	MENDOCINO	544	544	543	1,200	1,200	ACRE	45%
FOR-VEG-EST	0509	MODOC	1,609	1,543	1,364	1,646	1,900	ACRE	85%
FOR-VEG-EST	0511	PLUMAS	915	915	915	962	1,026	ACRE	89%
FOR-VEG-EST	0512	SAN BERNARDINO	340	27	27	343	473	ACRE	72%
FOR-VEG-EST	0513	SEQUOIA	N/A	N/A	N/A	1,070	N/A	ACRE	N/A
FOR-VEG-EST	0514	SHASTA TRINITY	626	585	558	1,207	1,518	ACRE	41%
FOR-VEG-EST	0515	SIERRA	N/A	N/A	N/A	115	706	ACRE	N/A
FOR-VEG-EST	0516	STANISLAUS	20	20	87	0	50	ACRE	40%
FOR-VEG-EST	0517	TAHOE	N/A	N/A	N/A	1,934	1,934	ACRE	N/A
FOR-VEG-EST	0519	LAKE TAHOE BASIN MGMT UNIT	10	0	0	10	10	ACRE	100%
FOR-VEG-EST	0598	R5 UNALLOCATED	N/A	N/A	N/A	N/A	169	ACRE	N/A
PACIFIC SOUTHWEST REGION Total			8,910	7,838	7,413	16,569	17,860	ACRE	50%

1. **Tabular** source data is "Actual" accomplishment that counts against target
2. **Tabular acres** of source records that have properly associated polygons
3. **GIS acres** of polygons associated with tabular records

Spatial Data Quality is front and center in Single Measure Report

ACCOMPLISHMENT: * FOR-VEG-EST | FISCAL YEAR: * 2015 | BLI: * Unified | REGION: * PACIFIC SOUTHWEST REGION | FOREST: * ANGELES

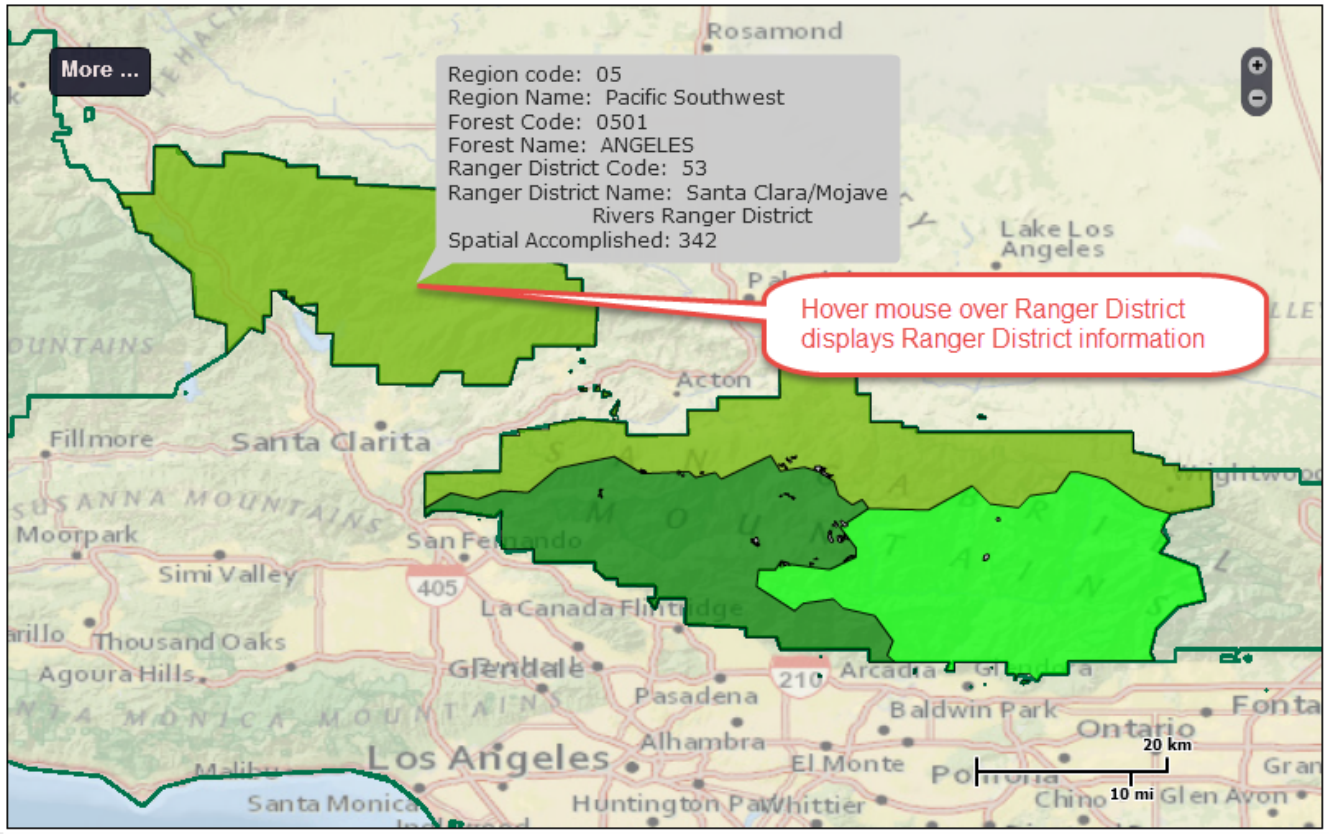
INITIATIVE: * None Selected

Display
- Show Map
- Show Graph

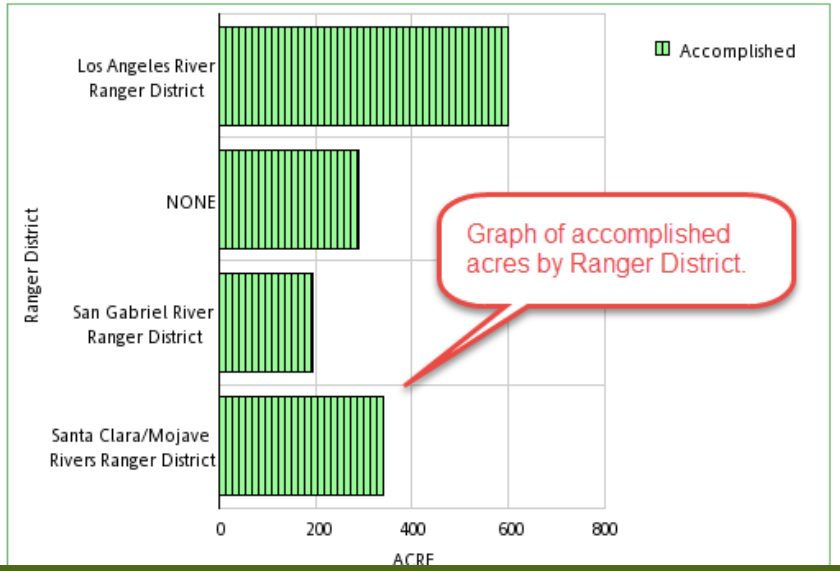
Select all Deselect all

Submit

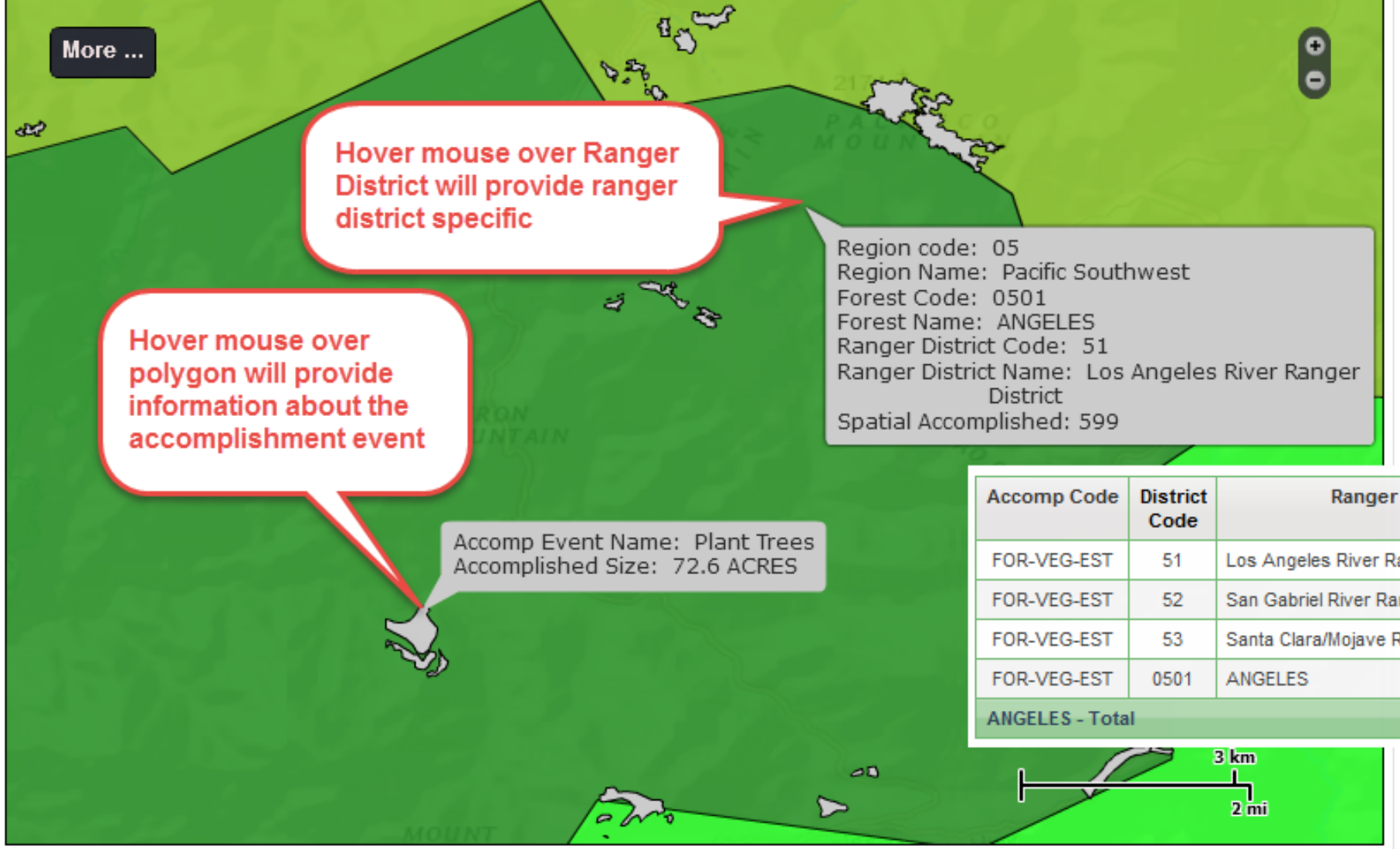
Check display options to show maps and graphs



Accomp Code	District Code	Ranger District	Accomplished with Spatial	Unit of Measure
FOR-VEG-EST	51	Los Angeles River Ranger District	599	ACRE
FOR-VEG-EST	52	San Gabriel River Ranger District	196	ACRE
FOR-VEG-EST	53	Santa Clara/Mojave Rivers Ranger District	342	ACRE
FOR-VEG-EST	0501	ANGELES	289	ACRE
ANGELES - Total			1,425	ACRE



Single measure Report - Forest Vegetation Established for the Angeles National Forest by Ranger District



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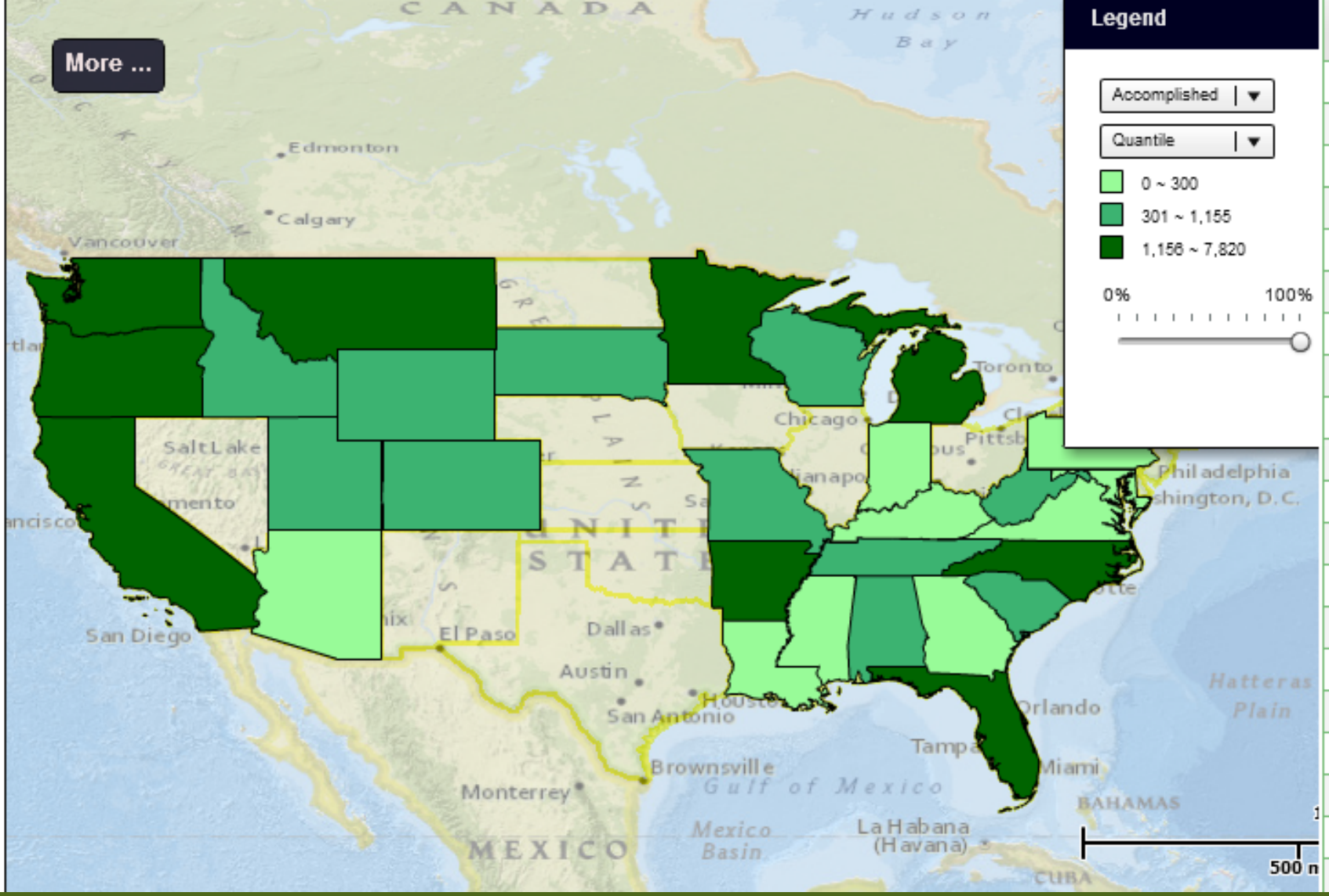
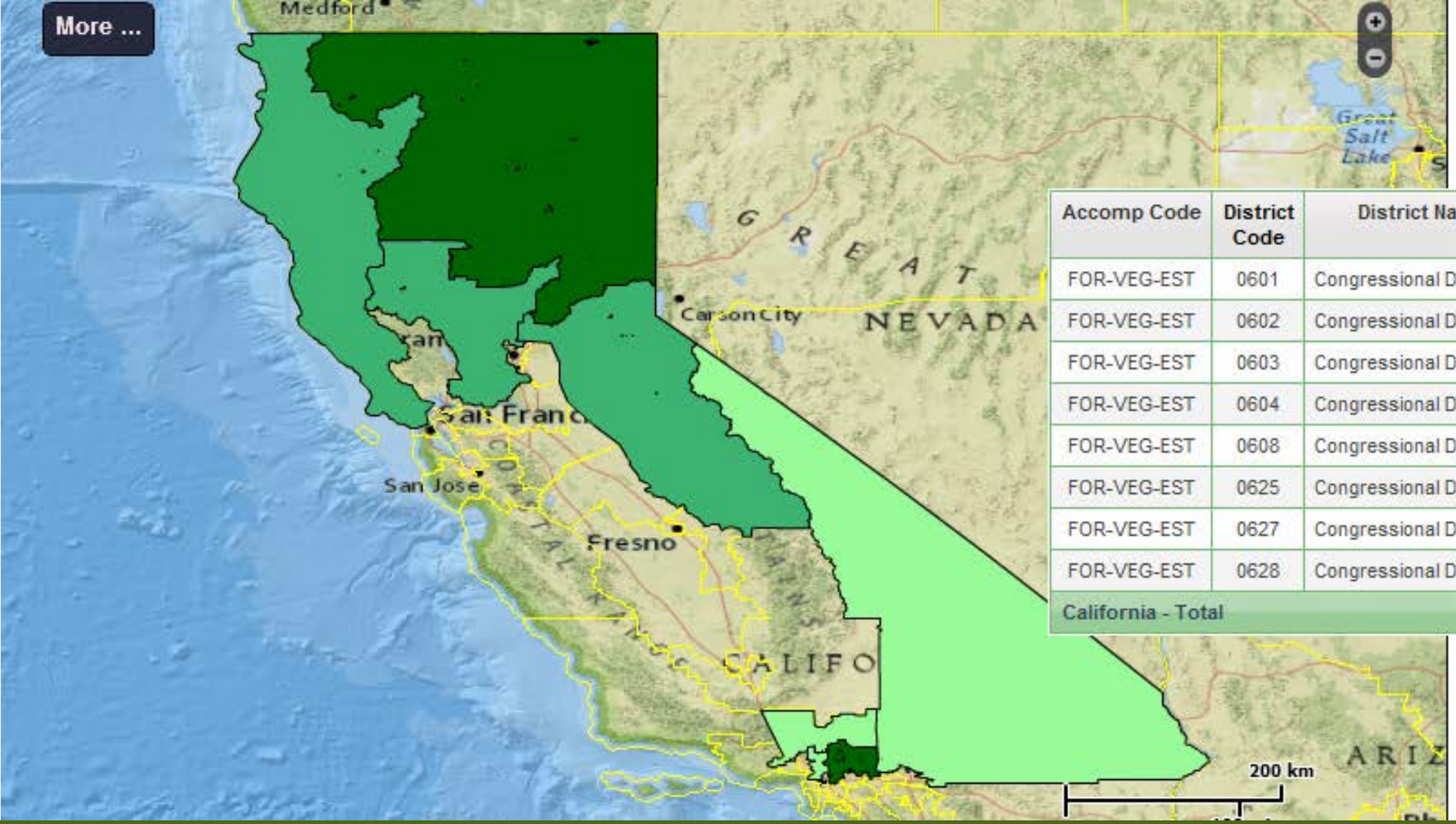
FOR-VEG-EST	53	Santa Clara/Mojave Rivers Ranger District	342	ACRE
FOR-VEG-EST	0501	ANGELES	289	ACRE
ANGELES - Total			1,425	ACRE

Detailed map view of accomplishments on the Angeles National Forest



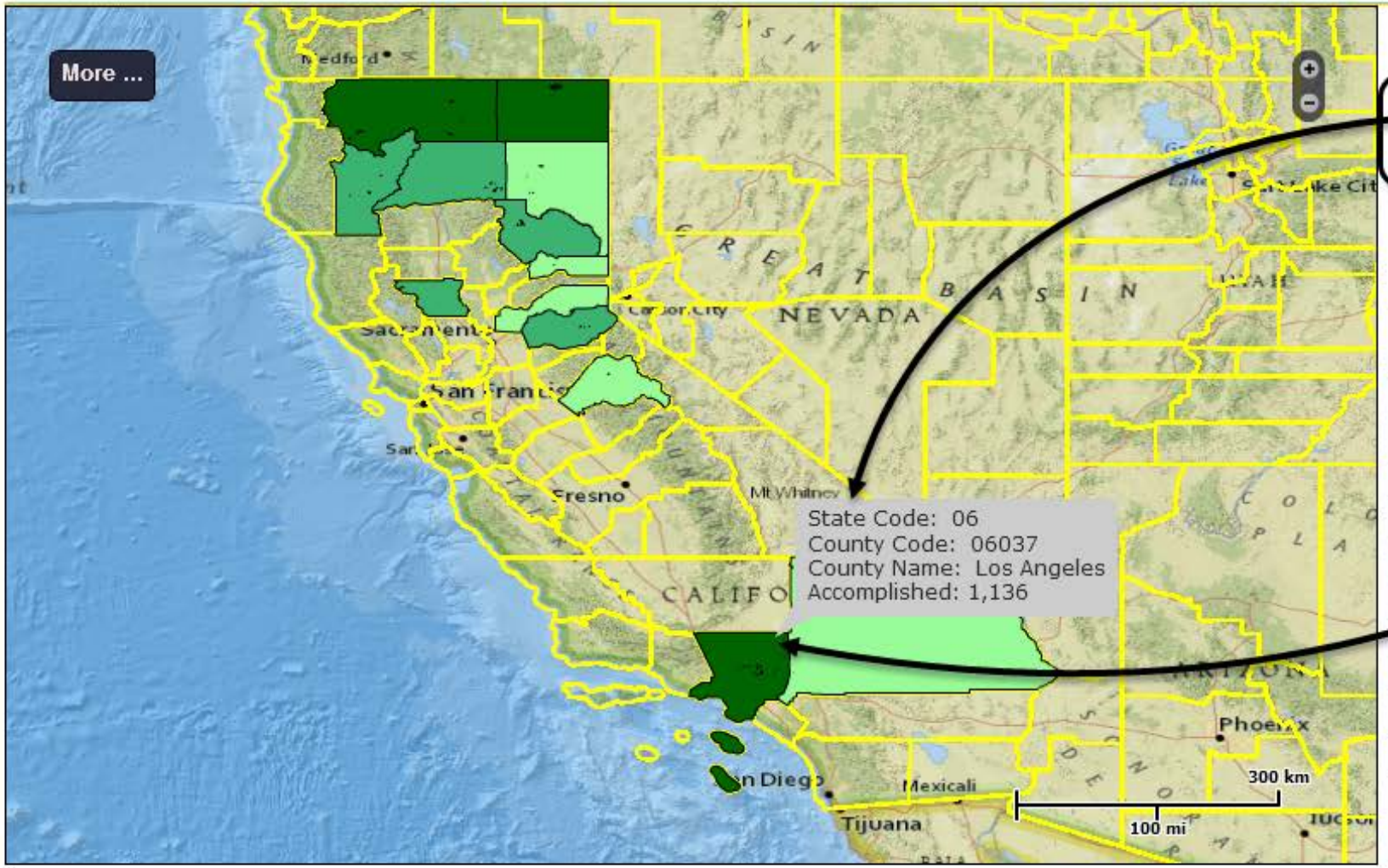
Accomp Code	State Code	Name	Accomplished with Spatial	Unit of Measure
FOR-VEG-EST	01	Alabama	984	ACRE
FOR-VEG-EST	02	Alaska	116	ACRE
FOR-VEG-EST	04	Arizona	9	ACRE
FOR-VEG-EST	05	Arkansas	1,156	ACRE
FOR-VEG-EST	06	California	7,820	ACRE
FOR-VEG-EST	08	Colorado	1,014	ACRE
FOR-VEG-EST	12	Florida	1,820	ACRE
FOR-VEG-EST	13	Georgia	48	ACRE
FOR-VEG-EST	16	Idaho	1,119	ACRE
FOR-VEG-EST	18	Indiana	35	ACRE
FOR-VEG-EST	21	Kentucky	41	ACRE
FOR-VEG-EST	22	Louisiana	248	ACRE
FOR-VEG-EST	24	Maryland	0	ACRE
FOR-VEG-EST	26	Michigan	3,843	ACRE
FOR-VEG-EST	27	Minnesota	2,161	ACRE
FOR-VEG-EST	28	Mississippi	240	ACRE
FOR-VEG-EST	29	Missouri	585	ACRE
FOR-VEG-EST	30	Montana	4,625	ACRE
FOR-VEG-EST	33	New Hampshire	112	ACRE
FOR-VEG-EST	37	North Carolina	1,390	ACRE

Geo political Accomplishment Reports start with States



Accomp Code	District Code	District Name	Accomplished with Spatial	Unit of Measure
FOR-VEG-EST	0601	Congressional District 1	5,081	ACRE
FOR-VEG-EST	0602	Congressional District 2	378	ACRE
FOR-VEG-EST	0603	Congressional District 3	544	ACRE
FOR-VEG-EST	0604	Congressional District 4	654	ACRE
FOR-VEG-EST	0608	Congressional District 8	27	ACRE
FOR-VEG-EST	0625	Congressional District 25	43	ACRE
FOR-VEG-EST	0627	Congressional District 27	1,043	ACRE
FOR-VEG-EST	0628	Congressional District 28	50	ACRE
California - Total			7,820	ACRE

From State maps users have a choice to drill down to Congressional District or…



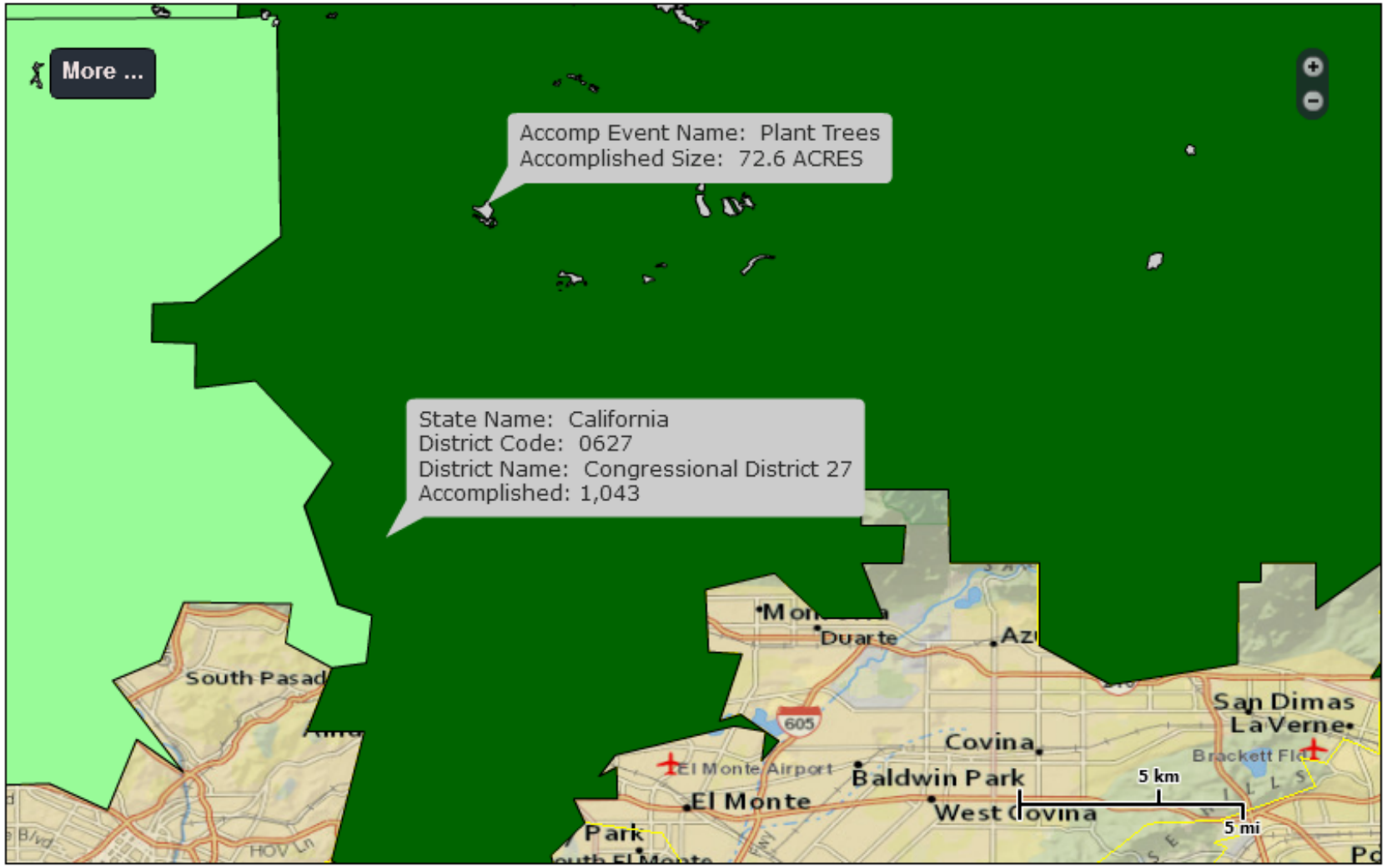
Mouse hover pop-up windows data is a repeat of contents in companion screen-readable tables which help us to provide 508 compliance.

Accomp Code	County Code	County Name	Accomplished with Spatial	Unit of Measure
FOR-VEG-EST	06011	Colusa	544	ACRE
FOR-VEG-EST	06017	El Dorado	327	ACRE
FOR-VEG-EST	06035	Lassen	320	ACRE
FOR-VEG-EST	06037	Los Angeles	1,136	ACRE
FOR-VEG-EST	06049	Modoc	1,787	ACRE
FOR-VEG-EST	06061	Placer	307	ACRE
FOR-VEG-EST	06063	Plumas	915	ACRE
FOR-VEG-EST	06071	San Bernardino	27	ACRE
FOR-VEG-EST	06089	Shasta	765	ACRE
FOR-VEG-EST	06091	Sierra	17	ACRE
FOR-VEG-EST	06093	Siskiyou	1,278	ACRE
FOR-VEG-EST	06105	Trinity	378	ACRE
FOR-VEG-EST	06109	Tuolumne	20	ACRE
California - Total			7,820	ACRE

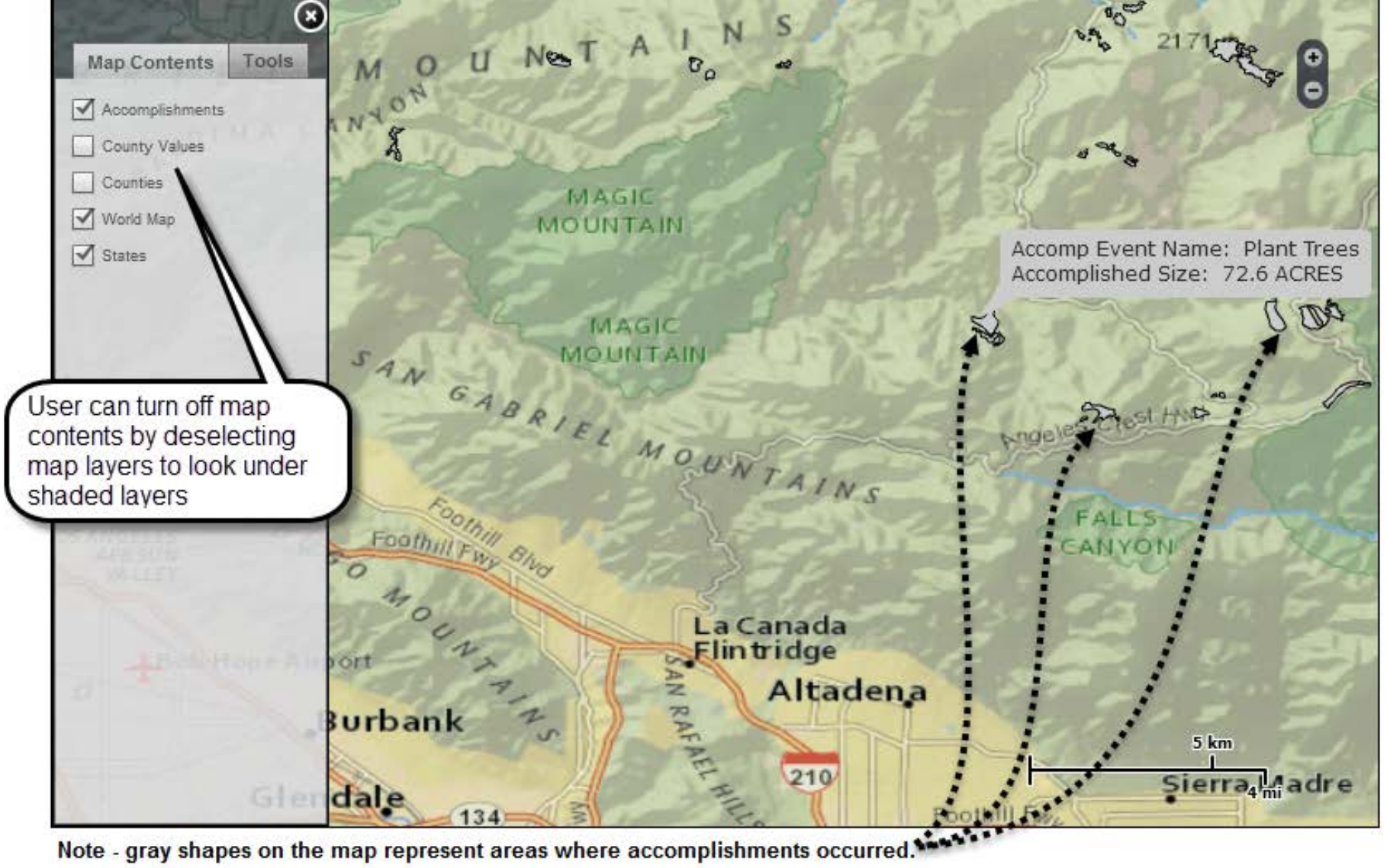
Note - gray shapes on the map represent areas where accomplishments occurred.

..From State to County

Single Measure by Congressional District for California
for Acres of forest vegetation established in Fiscal Year 2015



Zoom in on 27th Congressional District of California



Note - gray shapes on the map represent areas where accomplishments occurred.

User can modify map to see the desired world map detail Zoom in on Los Angeles County with values layer turned off

Project Challenges

- Data issues:
  - Spatial data alignment when combining spatial context from different sources
  - FS organization isn't consistent, presenting challenges in creating the enterprise-wide view of data
  - Spatial-tabular data integration issues are complex, resulting from a combination of legacy applications, mix of spatial and tabular ETL, and spatial and tabular reporting tools and requirements
- Field business processes:
  - Maintaining high quality geospatial data can burden field personnel who have other priorities
  - Misaligned traditional data collection schedules challenge year-end performance reporting spatial data quality during adoption years
- Cultural issues:
  - Inconsistent adoption of new toolset and recognition of the importance of spatial data collection
  - Varying levels of importance assigned to upward reporting

Summary

- Leveraging authoritative agency spatial data now allows us to report by locations that are of interest to our stakeholders (counties, congressional districts and special project areas).
- Enterprise Data Warehouse platform – the investment in the architecture and the enterprise geospatial data - provided the basis for development of gPAS.
- Business intelligence enables the ability to view the data at a more granular level and carry out analysis previously not possible.
- Publication of data in the gPAS reports realizes investment in data collected and sets us up to meet the increasing demand for locational transparency.

Questions?