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**Title:** Los Alamos Land Cover

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# Los Alamos Land Cover



# what is land cover?

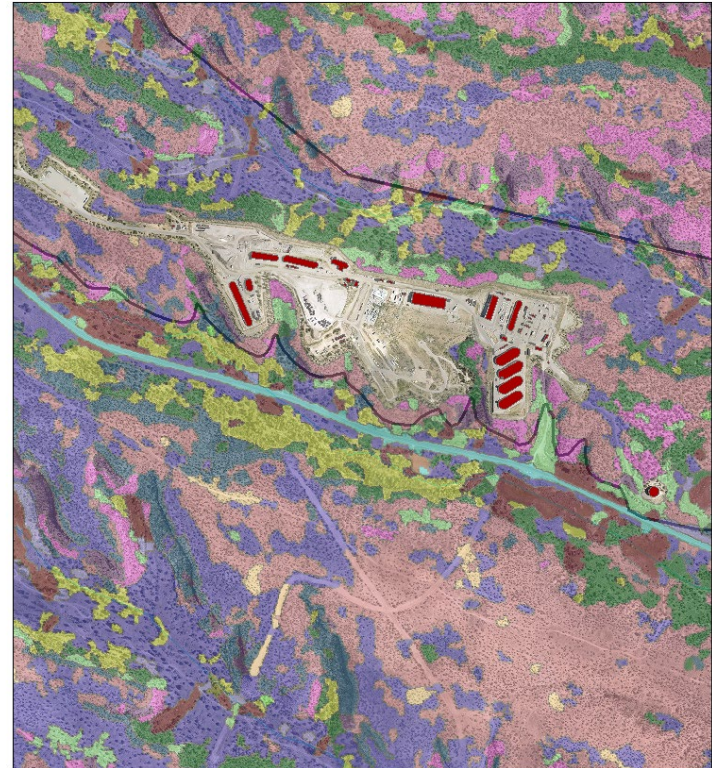
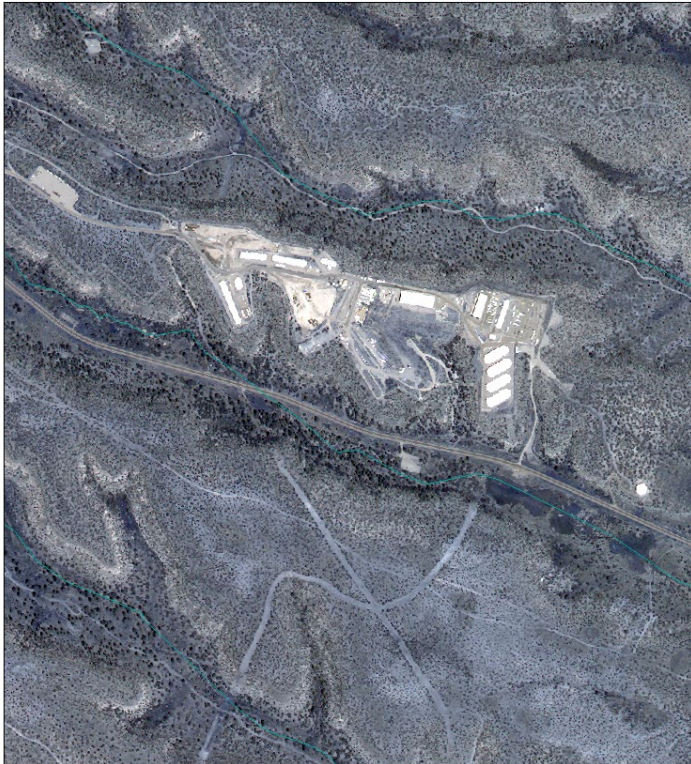
- land cover - [geography] The classification of land according to the vegetation or material that covers most of its surface; for example, pine forest, grassland, ice, water, or sand



# applications

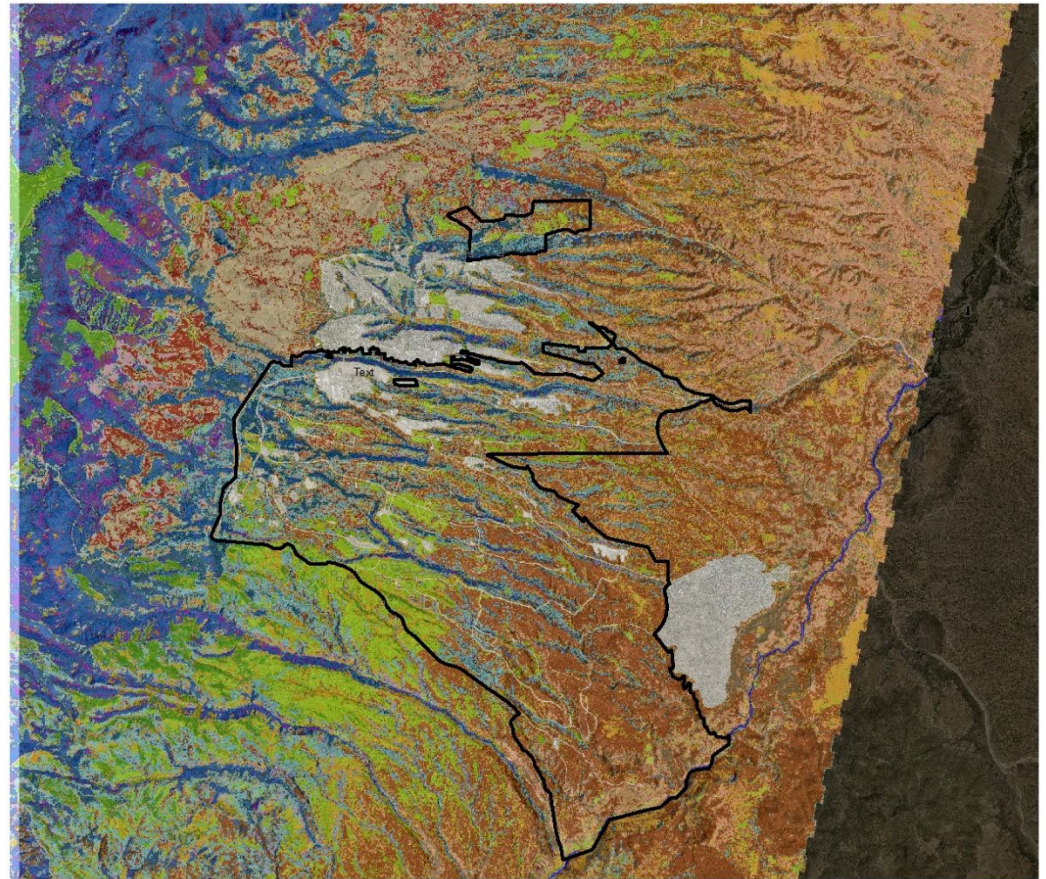
- Accurate wildfire model simulations and risk assessment, including decision-making during a wildfire event.
- Measuring and modeling climate change impacts on LANL.
- Planning forest and fuels management actions.
- Flood risk modeling.
- Carbon storage estimation.
- Benchmarking of dynamic vegetation models.
- Benchmarking of surface and subsurface water cycle models.
- Defining and monitoring changes in endangered species habitat boundaries.
- Meteorological modeling of plume dispersion behavior.
- Dose assessment modeling of wind dispersion of contaminants.
- Environmental impact evaluation of projects for site, facility, and infrastructure planning and for NEPA assessment.
- Make comparisons to previous land cover map to understand rates and directions of changes in land cover and plan for future

converts imagery to digital map



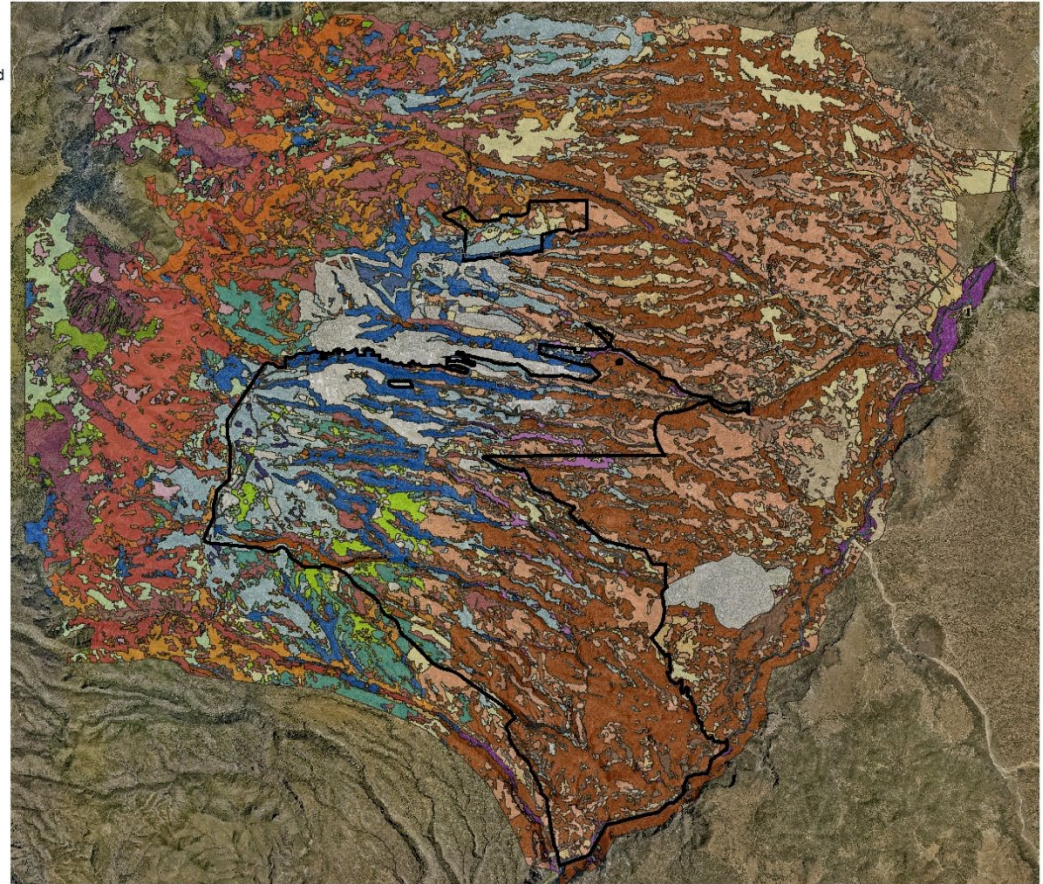
# 2001 land cover

- Based on 30m resolution 2001 LandSat TM+ satellite imagery
- After Cerro Grande fire
- Before bark beetle infestation and accelerated tree mortalities



# 2014 land cover

- Based on 2m resolution 2014 WorldView 2 satellite imagery
- After Cerro Grande fire, Los Conchas fire; drought; bark beetle infestation and accelerated tree mortalities



# brief disclaimer: land cover map accuracy

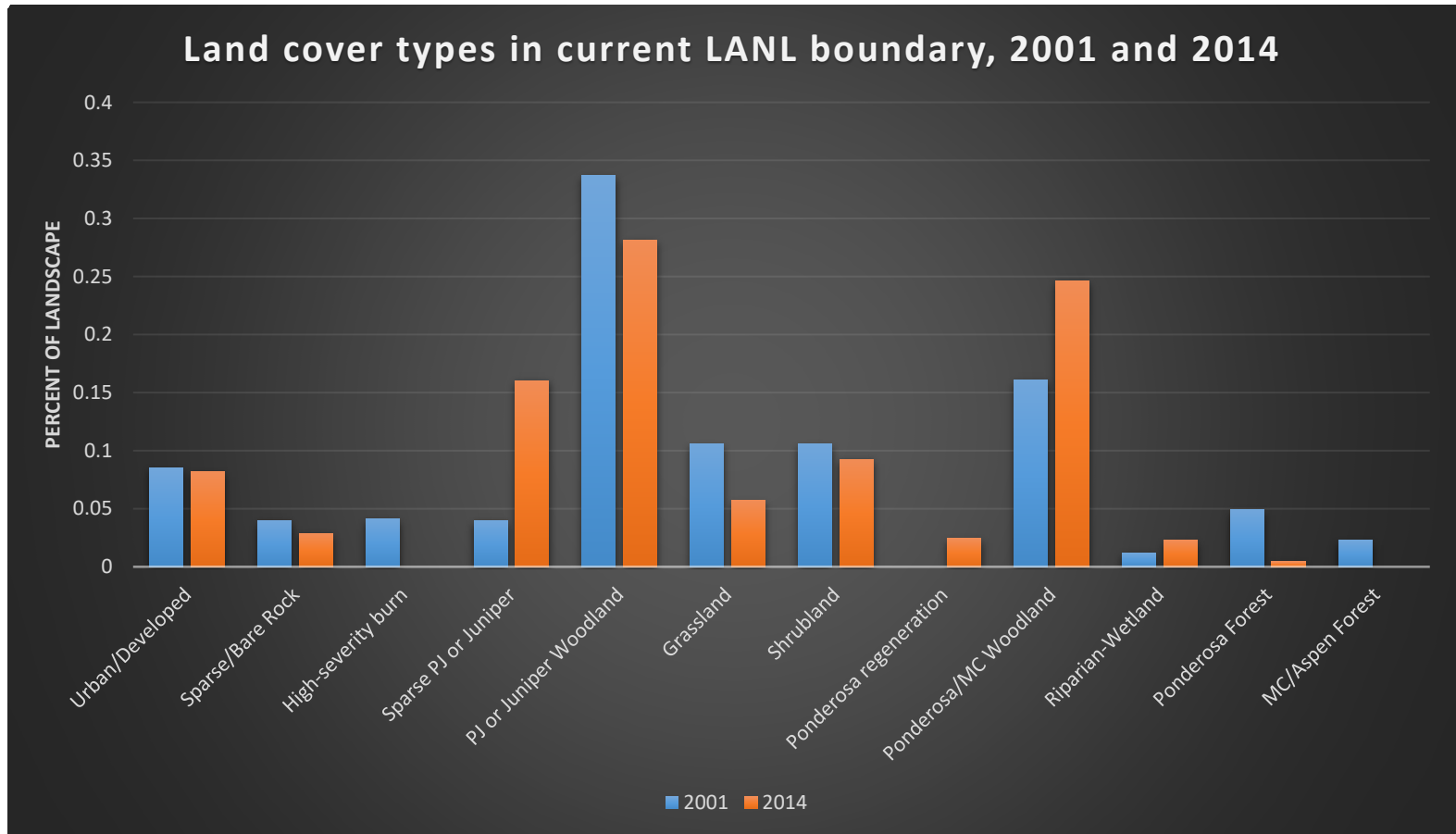
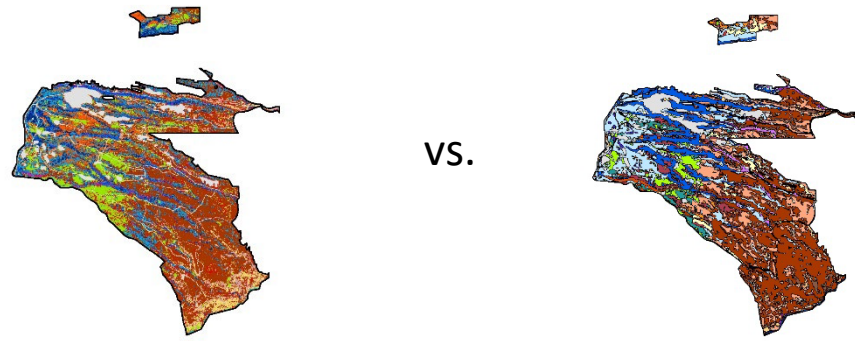
How much of the training data was correctly classified in the final map (producer's accuracy)?

- 2001: 86.3% (range by class is 50% to 100%)
- 2014: 77.8% (range by class is 52% to 100%)

How accurate was the map at classifying independent points?

- 2001: 52%
- 2014: ?

# what's changed?



# what's really changed?

## Mature piñons gone

- Out of 46 short-tree woodland plots visited in 2015, 2 (4%) had > 10% canopy cover of piñon trees.
- It is likely that canopy cover in short-tree woodland areas is less than it was in 2001.



# what's really changed?

## Forests rare

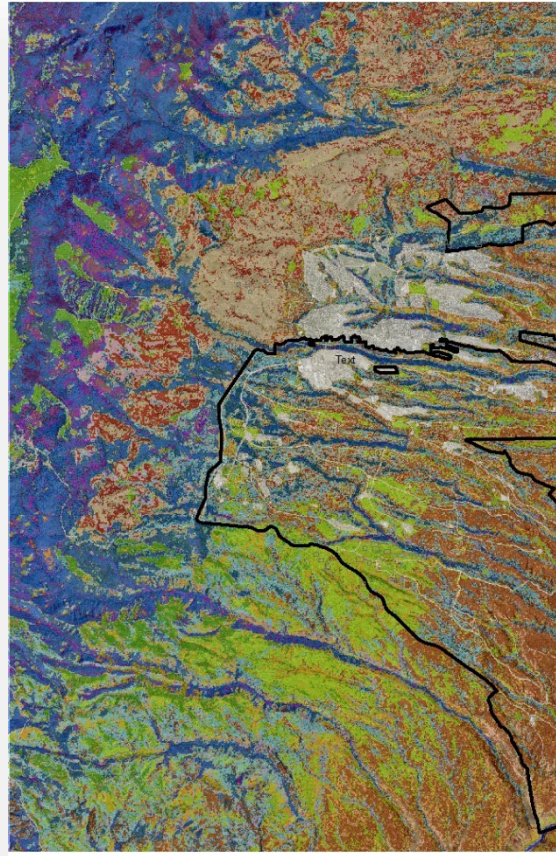
- Many areas that were classified as forests (> 60% canopy cover) in 2001 have woodland tree densities (<50% canopy cover) now.



# what's really changed?

## Shrublands in burn scars

- Cerro Grande and Las Conchas high-severity burn areas are growing back into shrubland cover types



2001



2014

# “new” land cover types

- Dense juniper woodland – replaces pinon-juniper woodland types



- Dense oak shrubland – one split of Gambel’s Oak shrubland type



# “new” land cover types

- Sparse oak shrubland – occurs on high-severity burn southern-facing slopes



- Sparse juniper woodland – replaces some pj woodland, wooded grasslands



# “new” land cover types

- Mixed species shrubland – burned areas; no one species dominant



- Ponderosa pine regeneration – some planted after Cerro Grande, some natural



# “new” land cover types

- Las Conchas recovering grassland – severely burned during Las Conchas fire



# process – vegetation classes

- identify preliminary vegetation classes

Suggested 2015 Revised Vegetation Classes

Name	Class_ID	Description
ARDR Herbaceous Vegetation	1	Herbaceous vegetation dominated by False Tarragon. Grass cover < 10%
ARTR Shrubland	2	Open, short-shrub canopy dominated by big sagebrush, usually with greater than 20% cover. Other associated shrubs may include snakeweed, chamisa, winterfat, or saltbush. Tree cover < 10%.
Asphalt Road	3	
BOGR Grassland	4	Moderate to dense (10% - 80%) herbaceous layer that is strongly dominated by blue grama. Scattered chamisa and snakeweed shrubs/subshrubs and an occasional pinyon, juniper, or ponderosa may be present.
CHNA Shrubland	5	Dominated by chamisa. Shrub cover ≥ 10%.
Deciduous Riparian Forest/Woodland	6	Diagnostic tree species include boxelder, narrowleaf cottonwood, and valley cottonwood.
Dense JUMO Woodland/Forest	7	Dominated by junipers with ≥ 30% canopy cover; occasional mature pinyon or ponderosa.
Dense PIED JUMO Woodland/Forest	8	Two-needle Pinyon and/or One-seed Juniper dominate or codominate tree canopy. Both present. Two-needle Pinyon canopy cover ≥ 10%, total tree Canopy cover ≥ 30%.
Mixed Conifer Forest	9	Moderately dense to dense tree canopy (> 50%). Overstory dominated or codominated by white fir and Douglas-fir. Ponderosa pine frequently present. Other conifers including juniper may be present.
Mixed Conifer Woodland	10	Moderately open to moderately closed tree canopy (25% – 50%). Dominant or codominant trees include white fir and Douglas-fir. Ponderosa pine frequently present. Other conifers including juniper may be present.
Montane-Subalpine Grassland	11	Open to dense perennial graminoid layer (60 – 70% cover). Usually contains one or more bunch grasses in the generaes Blepharoneuron, Danthonia, Festuca, Muhlenbergia. Trees are rare or incidental, shrubs typically absent though occasionally common. Elevation > 7200 feet.
Other Semievergreen Shrubland	12	Dominated by shrubs other than big sagebrush or chamisa. Shrub cover ≥ 10%. May include saltbush, sand sage, fringed sage, winterfat, prickly-pear cactus.
Other Deciduous Shrubland	13	Dominated by shrubs other than Gambel's Oak or New Mexico locust. Shrub cover ≥ 10%.
PIPO Forest	14	Moderately dense to dense Ponderosa pine canopy (≥ 50%) cover. Occasional occurrence of Douglas-fir or juniper. Herbaceous layer sparse. Shrubs may be present. High litter cover common.
PIPO Regeneration	15	Ponderosa seedlings/saplings planted or otherwise regenerating (typically in the area burned by the Cerro Grande fire). PIPO canopy cover ≥ 10%
PIPO Woodland	16	Open to moderately dense evergreen tree canopy ≥ 10%, < 50% canopy cover dominated by Ponderosa pine. Some

# process – training data

- select ~1/2 hectare plots that are representative of a vegetation class from orthophotos
- try to find at least 10 plots per class
- try to visit each plot to confirm its representativeness (ground-truthing)



# process – image classification

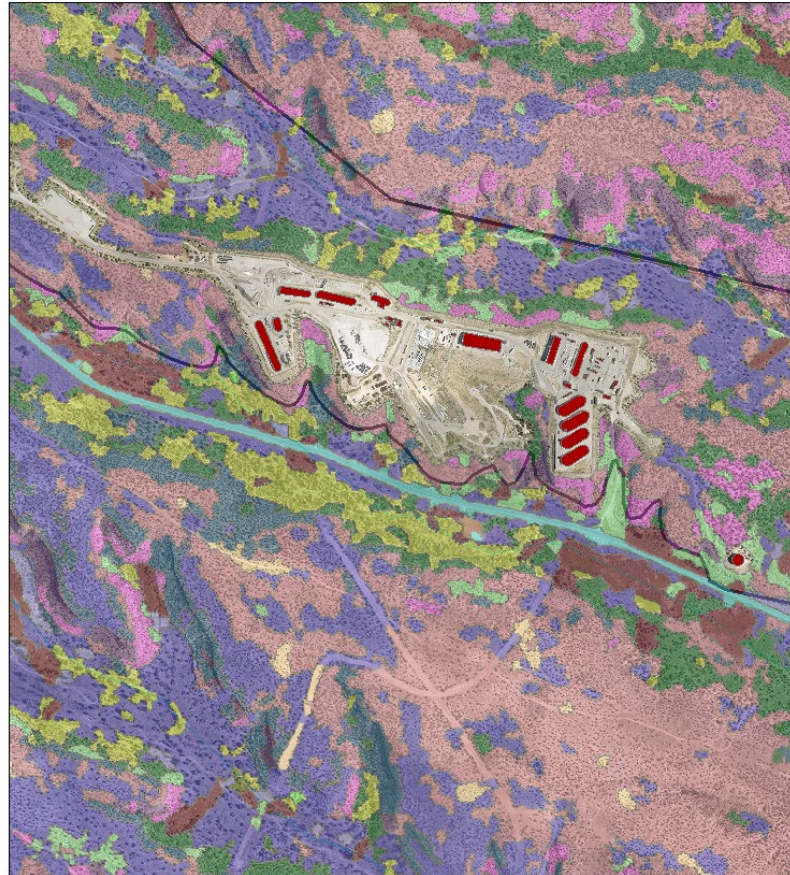
- give all your training data shapefiles (polygons with confirmed vegetation classes) to your analyst
- wait for the magic to happen



**multispectral bands**

# 2015 draft land cover map

- Based on 2m resolution 2014 WorldView satellite imagery
- After Cerro Grande fire, bark beetle infestation, drought, tree mortality, and Las Conchas fire



## Legend

### Class\_Name

ARTR Shrubland
Annual Herbaceous Vegetation
Asphalt Road
BOGR Grassland
Deciduous Riparian
JUMO Forest
JUMO Woodland
Other Shrubland
PIPO Forest
PIPO Woodland
PJ Forest
PJ Woodland
Semi-wet riverbed
Sparse-Bare Rock
Water
Wetland/Riparian Shrubland
structures_poly

# ARTR (big sagebrush) shrubland

Open, short-shrub canopy dominated by big sagebrush, usually with greater than 20% cover. Other associated shrubs may include snakeweed, chamisa, winterfat, or saltbush. Tree cover < 10%.

## Interesting facts:

- Found mostly around White Rock
- Indicates deeper soils
- Draft map identified lots of Juniper woodland (which may have ARTR in understory) as ARTR shrubland



# Dense JUMO (one-seeded juniper) woodland/forest

Dominated by junipers with  $\geq 30\%$  canopy cover; occasional mature piñon or ponderosa.

Interesting facts:

- We started out thinking we still had piñon-juniper woodland classes.
- But out of 58 plots we visited, only 5 (9%) had  $> 10\%$  canopy cover of mature piñons
- Almost all plots had piñon seedlings and saplings
- Now most of these plots classified as dense JUMO ( $\geq 30\%$  CC) or sparse JUMO ( $< 30\%$  CC)



# Mixed fire- adapted shrublands

Contains at least two of New Mexico locust, Gambel's oak, and shrub-sized aspen. Shrub cover > 10%, usually much greater. Associated with areas burned during Cerro Grande and Los Conchas. No one shrub species dominates.

Interesting fact:

- Yet another vegetation class that I created ad hoc, as I had no way to describe this mixed shrub community we found on the eastern slopes of the Jemez above Los Alamos



# mixed conifer woodland

Moderately open to moderately closed tree canopy (25% –50%). Dominant or codominant trees include white fir and Douglas-fir. Ponderosa pine frequently present. Other conifers including juniper may be present.

Interesting fact:

- It still exists. So far mixed conifer woodland is more common than mixed conifer forest.

