Proposal: Grand Canyon Ecology GIS Unit

Theme/ Big Idea	Human beings are part of the earth's ecosystems. Human activities can deliberately or inadvertently alter the equilibrium in ecosystems.
Content Standards (National)	**Science in Personal and Social Perspectives** <u>Natural and Human-induced hazards</u> Natural and human-induced hazards present the need for humans to assess potential danger and risk. Many changes in the environment designed by humans bring benefits to society, as well as cause risks. Students should understand the costs and trade-offs of various hazards.
Content Standards (Arizona)	**Strand 3: Science in Personal and Social Perspectives** **Concept 1: Changes in Environments** Describe the interactions between human populations, natural hazards, and the environment. **Concept 2: Science and Technology in Society** Develop viable solutions to a need or problem. **Concept 3: Human Population Characteristics** Analyze factors that affect human populations.
Identify key skills students will learn	Collaborate Critically solve problems
Identify district or school or district outcomes in this project	Rigor – Higher levels of Blooms Taxonomy
A need to know (motivator)	Yellowstone Fire (Playing God in Yellowstone book) Wallow Fire Grand Canyon Fire
Essential question or problem	The Wallow Fire burned 519,319 acres costing more than $53 million taxpayer dollars. How can we prevent or minimize the impact of fire in our state treasure – The Grand Canyon.
Define the products and artifacts for the project including criteria	**Early** (Identify misconceptions and ideas) Take a Stand – Rank Fire good/ bad, fold and discuss **During** (Formative Assessment – artifacts) Notebook and Classroom Discussion • Demonstrates clear understanding of concepts for each of the objectives • Teacher to use this as a tool to check understanding **End**: (Summative Assessment) Student Proposal / Recommendation Criteria: • Use GIS data to show the problem • Applies fire ecology theory in identification of problem • Evaluates how to best address the problem • Integrates GIS data and fire ecology theory to produce a carefully planned solution.

Map the Project	**Students evaluate fire based on prior knowledge.** Take a Stand Yellowstone Fire - http://www.youtube.com/watch?v=pNhaZHyiE1s Big Question: What impact would a large fire in the Grand Canyon have on Arizona? KWL - wildfire
	Students will use GIS to measure Wallow Fire and predict future fire activity in given conditions Resources: Wallow geodatabase including native vegetation and Wallow fire geoimage (Wallow _fire.mxd) Homework: Why study fire Close: Add to KWL
	Students will develop scenarios that present a variety of environmental factors and predict their impact on possible fire in the area. Brainstorm environmental factors that impact fire behavior. Homework: Read Weather, Fuels and Topography Handout Assessment: Student choice of transmission method matching objective above. Close: Add to KWL
	Students will compare and contrast a variety of fuels and their contribution to fire based on weather and fuels lab. Weather and Fuels Lab Close: Add to KWL
	Based on the topography and fuel density lab students will evaluate the wildfire potential for a given topography. Topography and Fuel Density Lab Close: Add to KWL Homework: revisit Wallow fire prediction and revise as necessary – see Wallow Fire Rubric. (Wallow _fire.mxd)
	Students will evaluate a fire ignitions in GCNP to determine where most fires are started and the source of most fires. Fire ignition mxd will be symbolized to determine the cause of most fires, location and size of most fires. Students will use the map analyze the data and to present their findings

	Students will criticize or define fire suppression based on the movie Fire Wars and Fire on the Landscape Handout. Fire Wars Movie Students create a roleplay demonstrating the various points of view represents Close: Add to KWL Homework: Read Fire on the Landscape Assessment: Fire Suppression Rubric
	Students will create criteria to assess if a fire was a high-intensity fire or a low intensity fire after participating in the Fire and the Web of Life Activity. Fire and the Web of Life Close: Add to KWL
	Students will compare and contrast Ponderosa, Pinyon and Juniper Woodland ecosystems from Internet research.
	Students will use their knowledge of Ponderosa pine adaptation to create a tree that will not burn under low-intensity fire conditions.
	Students will use GPS devices and cameras to collect forest data about fuel load. (Teacher to load Lat/Long data and set up tables for students to use.)
	Students will assess the fire potential based on GIS map. Introduction: Fire Potential MXD Show the same map with different symbologies. Have the students determine which is more informative and why. Demonstrate how to create symbology. Students will use the already created map with data about fuel load. They will use symbology to analyze and predict areas with greater fire load. Students will use maps to support their point of view. Fire Potential Rubric
	Students will create a GIS map that compiles fuel data collected. They will return to the school and input data into a standardized format table with possible subtypes to prevent input error table created by their teacher. (Teacher to append tables for later use) Grand Canyon MXD

	Students will compare and contrast fire management options and students will propose a plan of action for a given situation. Management Choices Activity Close: KWL
	Students will create a proposal to limit the fire potential in the area of investigation. GIS Activities: Import Points Create Slope from DEM file Add Photos to points Students will create a proposal supported by their map on how to handle fuel overload in the areas that they investigated in the Grand Canyon. Fire Management Choices Rubric

Data sources used: -

http://fia.fs.fed.us/tools-data/default.asp

GCNP data files obtained from NAU (Mark Manone)

Natural Resource Information Portal (GIS data source for National Parks)

Lesson References:
http://www.nps.gov/grca/forteachers/loader.cfm?csModule=security/getfile&PageID=523000

Rubrics

Wallow Fire

Students will predict the progression based on information given. They need to make a claim and justify that claim with evidence from the map and fire incident website http://inciweb.org/incident/2262/ and June 15, 2011 Landsat 5 satellite image http://earthobservatory.nasa.gov/NaturalHazards/view.php?id=51064

		Level	
Component	Unsatisfactory (Below Performance Standard)	Proficient (Acceptable)	Advanced (Demonstrates exceptional performance)
Claim: An assertion or conclusion that answers the original question	Does not make a claim or makes an inaccurate claim ---------- *States that the fire will jump to Washington state*	Makes an accurate but incomplete claim ---------- *Vague statement like "the fire will continue to burn"*	Makes and accurate and complete claim ---------- *Explicitly states "The fire will move in a southerly direction until it runs out of fuel"*
Evidence: Scientific data that supports the clai. The data needs to be appropriate and sufficient to support the claim	Does not provide evidence or only provides inappropriate evidence. (Evidence that does not support claim) ---------- *Provides no evidence for fire prediction, inaccurate evidence ("the elements of fire are not present")*	Provides appropriate but insufficient evidence to support claim. May include some inappropriate evidence ---------- *Provides evidence for fire prediction based on only one or two of the factors that impact fire.*	Provides appropriate and sufficient evidence to support claim ---------- *Provides evidence for fire prediction based on three or more of the factors that impact fire.*
Reasoning A justification that links the claim and evidence and shows why the data counts as evidence to support the claim by using the appropriate and sufficient principles	Does not provide reasoning or only provides reasoning that does not link evidence to claim or provides incorrect reasoning. ---------- *Provides inappropriate statement ("because that is what I think") or incorrect reasoning ("wind will blow the fire out")*	Provides reasoning that links the claim and evidence. Repeats the evidence and/or includes some scientific principles but not sufficient. ---------- *Justifies prediction by explaining how one or two factors impact fire. ("Fire needs oxygen and additional oxygen is being provided by…")*	Provides reasoning that links evidence to claim. Includes appropriate and sufficient scientific principles. ---------- *Justifies prediction by explaining how three or more factors impact fire.* *("Factors that impact fire intensity are……*

Fire Suppression Policy

Students will criticize or define the US policy of fire suppression.

		Level	
Component	Unsatisfactory (Below Performance Standard)	Proficient (Acceptable)	Advanced (Demonstrates exceptional performance)
Claim: An assertion or conclusion that answers the original question	Does not make a claim or makes an inaccurate claim ---------- *States that "all fires are allowed to burn"*	Makes an accurate but incomplete claim ---------- *Vague statement like "fire suppression has led to problems such as …"*	Makes and accurate and complete claim ---------- *Explicitly states "The US policy of fire suppression was instituted because… however we now know that…"*
Evidence: Scientific data that supports the clai. The data needs to be appropriate and sufficient to support the claim	Does not provide evidence or only provides inappropriate evidence. (Evidence that does not support claim) ---------- *Provides no evidence for claim, inaccurate evidence ("fire is never a helpful tool")*	Provides appropriate but insufficient evidence to support claim. May include some inappropriate evidence ---------- *Provides some correct evidence for claim ("Without fire forests ….")*	Provides appropriate and sufficient evidence to support claim ---------- *Provides multiples points of evidence for claim. "Without fire forests ….")*
Reasoning A justification that links the claim and evidence and shows why the data counts as evidence to support the claim by using the appropriate and sufficient principles	Does not provide reasoning or only provides reasoning that does not link evidence to claim or provides incorrect reasoning. ---------- *Provides inappropriate statement ("because that is what I think") or incorrect reasoning ("wind will blow the fire out")*	Provides reasoning that links the claim and evidence. Repeats the evidence and/or includes some scientific principles but not sufficient. ---------- *Justifies prediction by explaining how one or two factors impact fire. ("Fire needs oxygen and additional oxygen is being provided by…")*	Provides reasoning that links evidence to claim. Includes appropriate and sufficient scientific principles. ---------- *Justifies prediction by explaining how three or more factors impact fire. ("Factors that impact fire intensity are……*

Fire Potential Assignment

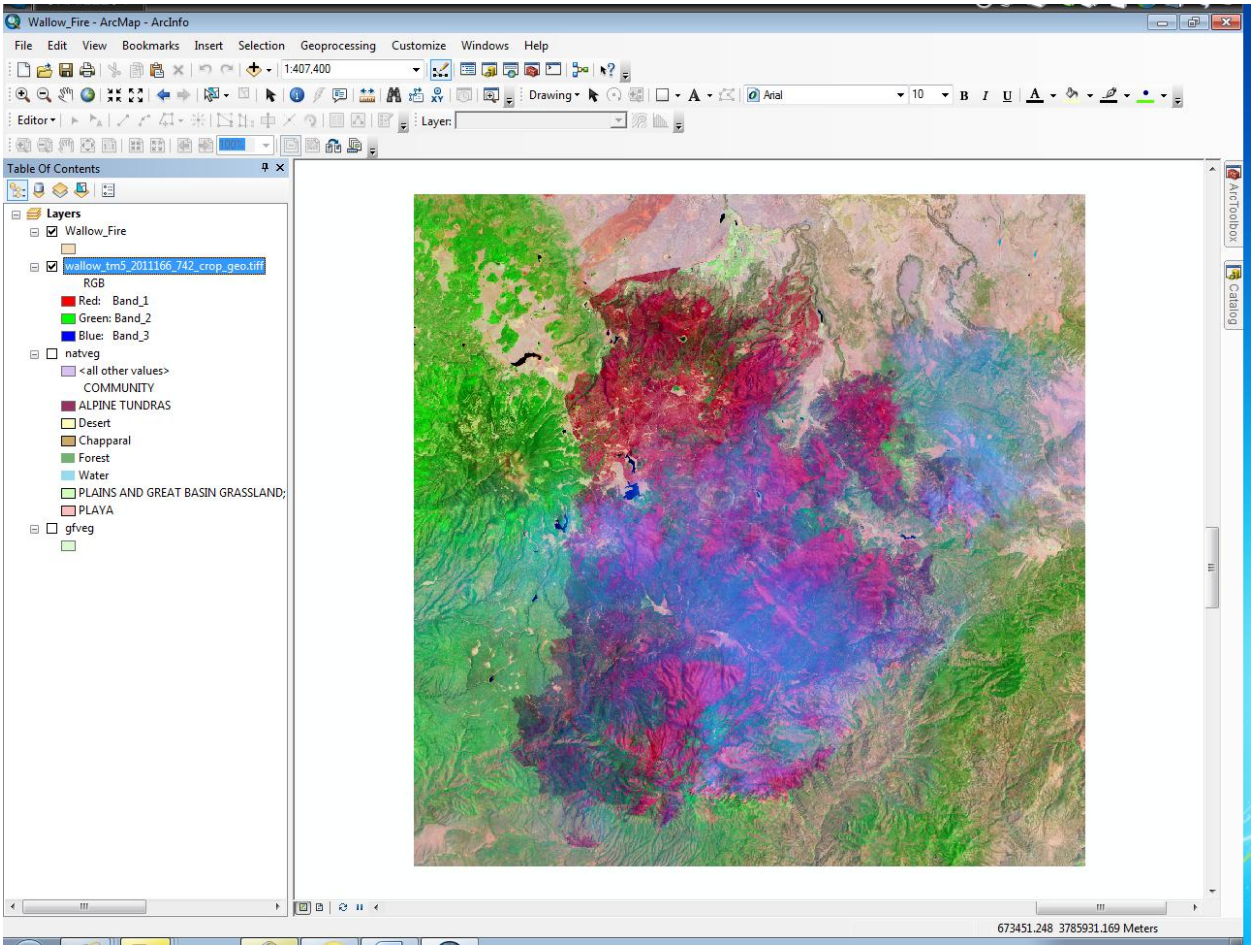
		Level	
Component	Unsatisfactory (Below Performance Standard)	Proficient (Acceptable)	Advanced (Demonstrates exceptional performance)
Claim: An assertion or conclusion that answers the original question	Does not make a claim or makes an inaccurate claim ---------- States that "fire will burn with the same intensity everywhere"	Makes an accurate but incomplete claim ---------- n/a	Makes and accurate and complete claim ---------- Identifies an area with higher fire potential
Evidence: Scientific data that supports the clai. The data needs to be appropriate and sufficient to support the claim	Does not provide evidence or only provides inappropriate evidence. (Evidence that does not support claim) ---------- Incorrectly identifies areas area of higher fire potential	Provides appropriate but insufficient evidence to support claim. May include some inappropriate evidence ---------- Provides some GIS data to support claim. Uses some symbology.	Provides appropriate and sufficient evidence to support claim ---------- Provides multiple GIS data sources showing higher fuel concentration through appropriate symbology
Reasoning A justification that links the claim and evidence and shows why the data counts as evidence to support the claim by using the appropriate and sufficient principles	Does not provide reasoning or only provides reasoning that does not link evidence to claim ---------- No relationship between fuel load and fire intensity is given	Provides reasoning that links the claim and evidence. Repeats the evidence and/or includes some scientific principles but not sufficient. ---------- Explains how fuel load contributes to fire intensity ("The larger symbols show areas with larger concentrations of 1000 hr downed wood which would provide the fire much fuel to burn")	Provides reasoning that links evidence to claim. Includes appropriate and sufficient scientific principles. ---------- Explains the difference between each fuel type and how it would impact the intensity of the fire. ("Litter as shown in the green symbols provides little fuel for fires to burn. Howevever, ….")

Management Choices

Students will describe why fire is a greater danger today since our policy of fire suppression has started. Students will the negative impacts of fire on a environmental communities and human communities. They will then propose management choices to reduce or eliminate the impact of fire on human populations and ecosystems.

		Level	
Component	Unsatisfactory (Below Performance Standard)	Proficient (Acceptable)	Advanced (Demonstrates exceptional performance)
Science and Social Perspectives	Does not explain why fire is a greater danger today Does not describe fire's impacts on the environment or the human populations	Lists human activities that have contributed to fire. Lists some of fires impacts	Assesses the reasons for fire danger today in relation to US Fire policy current and historical and the impacts of fire on both humans and the environment.
Claim: An assertion or conclusion that answers the original question	Does not make a claim or makes an inaccurate claim ---------- *Polygon drawn around an area not investigated.*	Makes an accurate but incomplete claim ---------- NA	Makes and accurate and complete claim ---------- *Identifies areas to be managed and management method to be used using GIS tools. (Draw a polygon around the area to be targeted and note that it will be thinned using non-fire treatment)*
Evidence: Scientific data that supports the clai. The data needs to be appropriate and sufficient to support the claim	Does not provide evidence or only provides inappropriate evidence. (Evidence that does not support claim) ---------- No evidence or inaccurate mapping in ArcGIS	Provides appropriate but insufficient evidence to support claim. May include some inappropriate evidence ---------- *Uses at least one source of evidence collected and GIS data to support claim. ("Non-fire treatment should be used because the fuel load here is …")*	Provides appropriate and sufficient evidence to support claim ---------- *Uses multiple sources of evidence collected and GIS data to support claim. ("Non-fire treatment should be used because the fuel load here is … and the slope is … and there is little human habitation in the area")*
Reasoning A justification that links the claim and evidence and shows why the data counts as evidence to support the claim by using the appropriate and sufficient principles	Does not provide reasoning or only provides reasoning that does not link evidence to claim ---------- *Analyzes the costs, benefits and risks associated with proposed management method. ("Hand thinning such as …. would be the best because its cheaper)*	Provides reasoning that links the claim and evidence. Repeats the evidence and/or includes some scientific principles but not sufficient. ---------- *Limited reasoning without looking at costs, benefits and risks associated with proposed management method. ("Prescribed fire would be better because it would get rid of the fuel load")*	Provides reasoning that links evidence to claim. Includes appropriate and sufficient scientific principles. ---------- *Analyzes the costs, benefits and risks associated with proposed management method. ("Hand thinning such as …. would be the best because* *A –* *B-* *C –* *")*

Wallow Fire Map – June 15



The newly burned land left in the wake of the Wallow Fire is dark red in this false-color image taken on June 15, 2011. The image, acquired by the Landsat 5 satellite, is made with infrared light. The slightly blue blur is smoke, and dots of bright orange-red on the south side of the burn are active fires. Unburned forest is green, and sparsely vegetated land is pink.

By the end of the day on June 15, the Wallow Fire had burned 487,016 acres of forest in eastern Arizona and was 20 percent contained. Most of the fire activity was on the south side of the fire, away from the majority of the communities that had been evacuated. Among the places evacuated were Greer and Eager, labeled in the image. Irrigated plants (like lawns) are pale spots of green and buildings are tiny dots of blue. Most of the 32 homes destroyed in the fire were in Greer, where the fire clearly burned to the edge of the community. While the burned area encroaches on Eager in places, a buffer of green separates the community from the fire

Basic Information

Incident Type	Wildfire
Cause	Under Investigation
Date of Origin	Sunday May 29th, 2011 approx. 01:30 PM
Location	Eastern AZ near Alpine, Nutrioso, and Springerville
Incident Commander	Area Commander Jim Loach

Current Situation

Total Personnel	2,846
Size	534,639 acres
Percent Contained	67%
Fuels Involved	10 Timber (litter and understory)
Fire Behavior	Zone 1: Small islands of interior heat became active after sun up and produced short runs in stringers of interior fuels. Smoldering 1000 hr fuels are being totally consumed by fire. Zone 2: Aggressive backing and flanking fire on the south perimeter with frequent torching. Zone 3: Backing and flanking with single tree torching.
Significant Events	Zone 1: Community meeting in the City of Springerville. Zone 2: Pincha-Tulley IMT1 assumed command at 0600 today, June 23rd. Resources held the fire north of Blue River drainage. Resources made good progress constructing dozer line from HWY 191 toward the Primitive Area boundary in the Strayhorse drainage area. Zone 3: Continue mop-up, patrol, and rehab.

Outlook

Planned Actions	Zone 1: Mop-up and secure firelines while providing for point protection as needed. Rehab will continue including chipping along roads and seeding dozer lines. Zone 2: Structure protection in Luna, Alpine, and Blue River area. Strengthen, secure, and burn out prepared lines. Continue indirect line and prepare for burn out east of HWY 191 in the Strayhorse drainage. Zone 3: Continue mop-up, patrol, and rehab in all areas.
Growth Potential	High
Terrain Difficulty	High
Remarks	Zone 1: Two injuries occurred over the last two days but were determined today to be lost time incidents this morning. Will continue demobilization of excess resources. Zone 2: One injury reported was non-traumatic and is pending diagnosis. Contingency planning is in progress to address concerns on the southern portion of the fire. Zone 3: None.

Current Weather

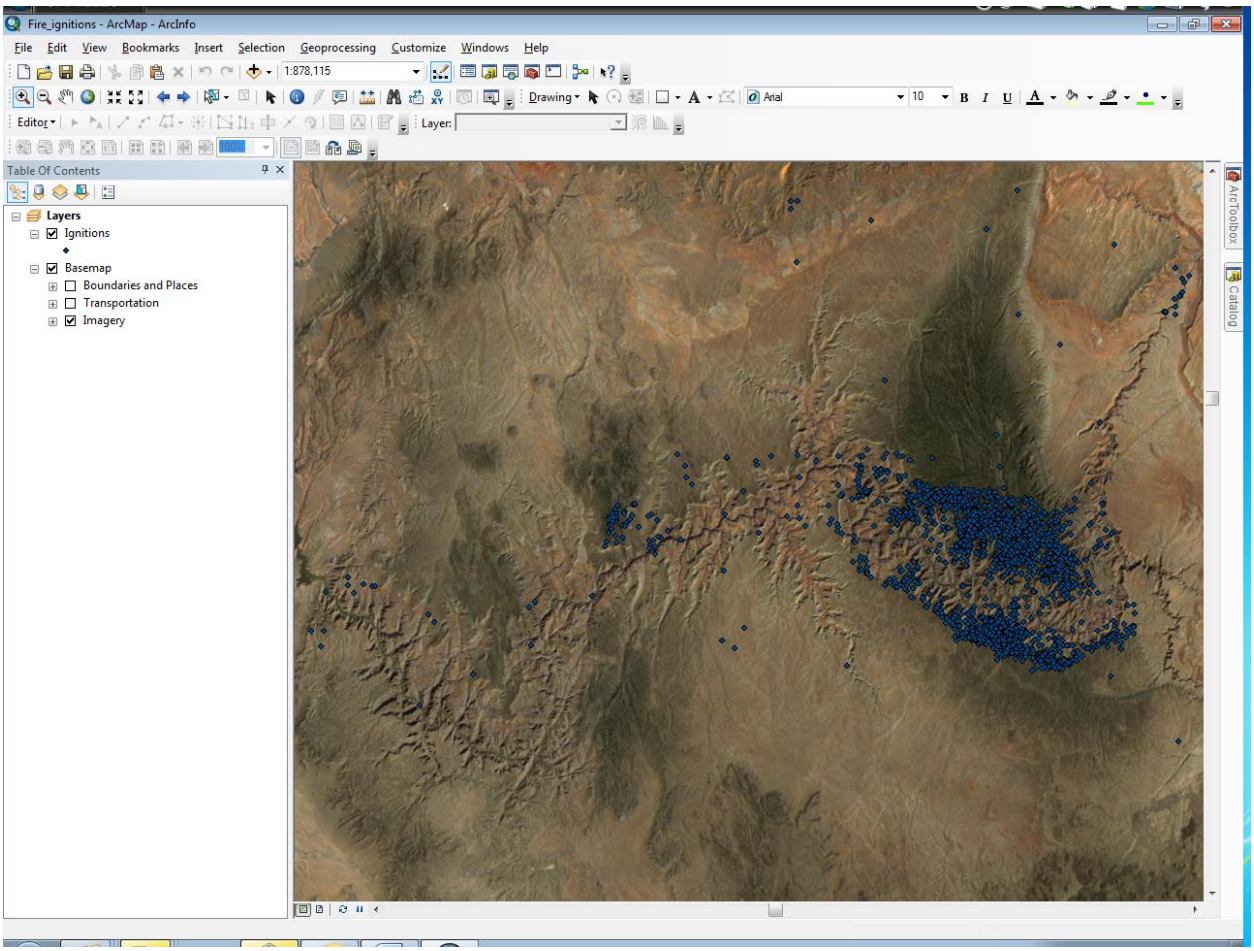
Wind Conditions	19-31 mph SW
Temperature	85-97 degrees

Ignition Map

Students will copy the ignition layer.

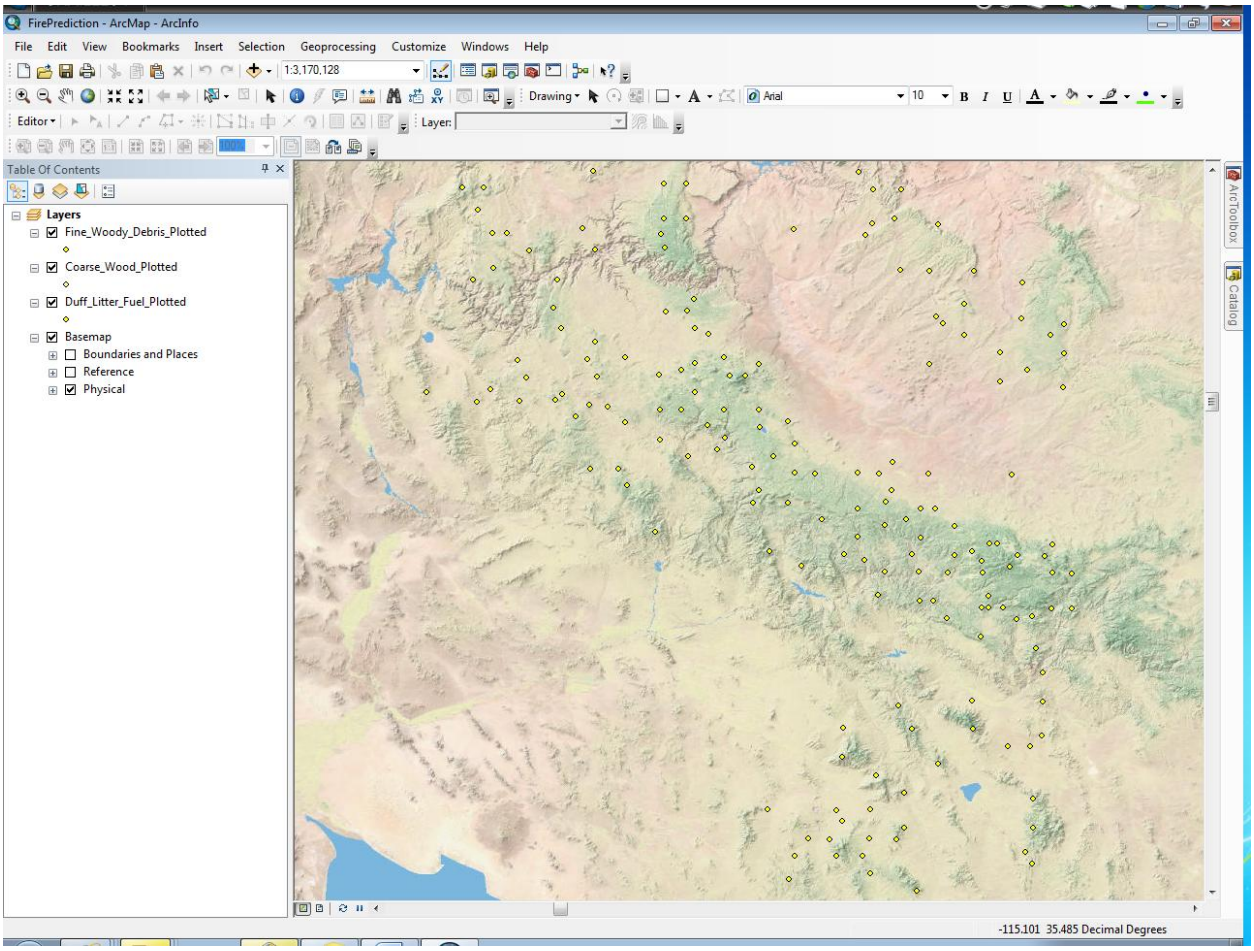
They will symbolize the layer initially based on source (M-L)

The will also symbolize it based on fire size.

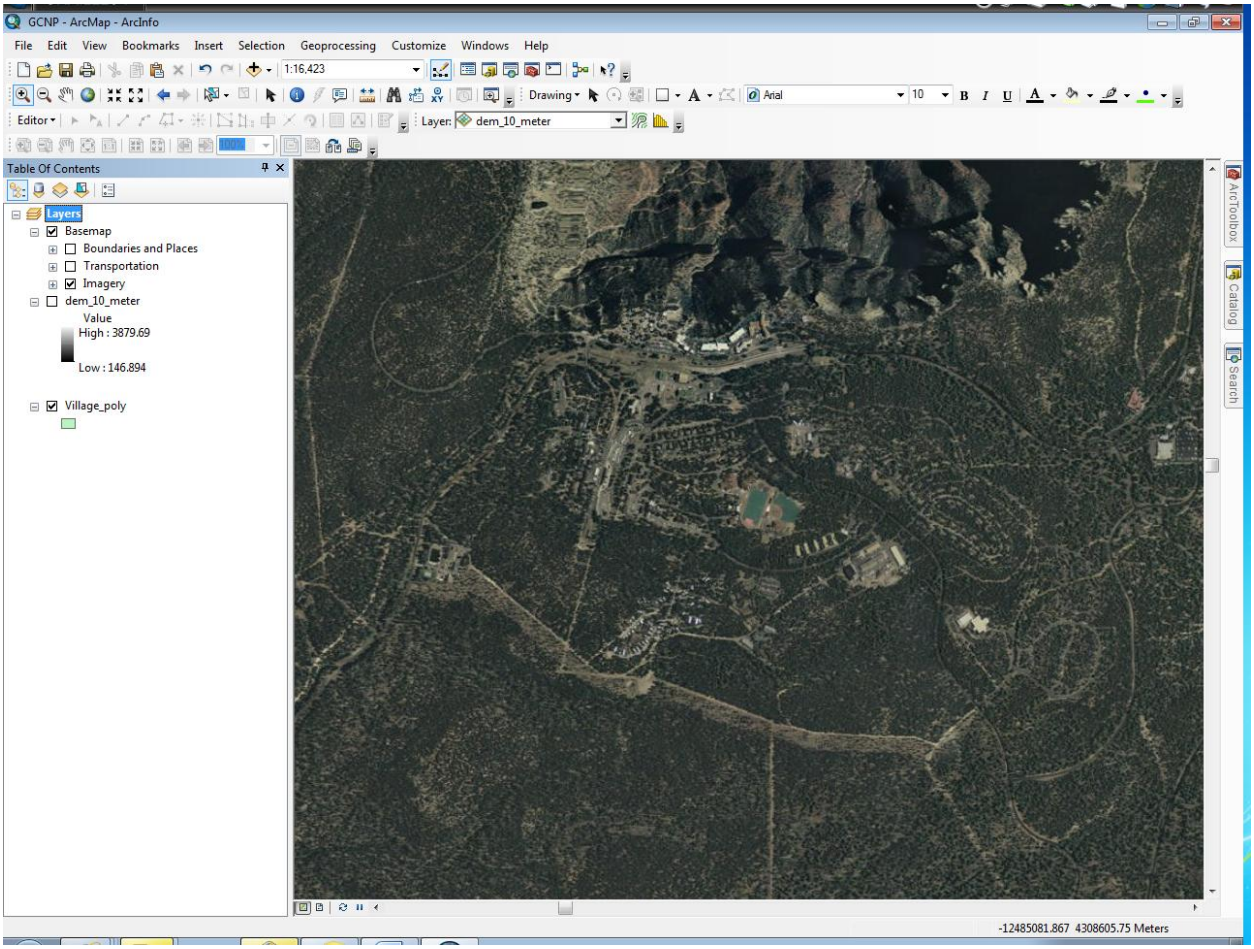


Fire Prediction Map

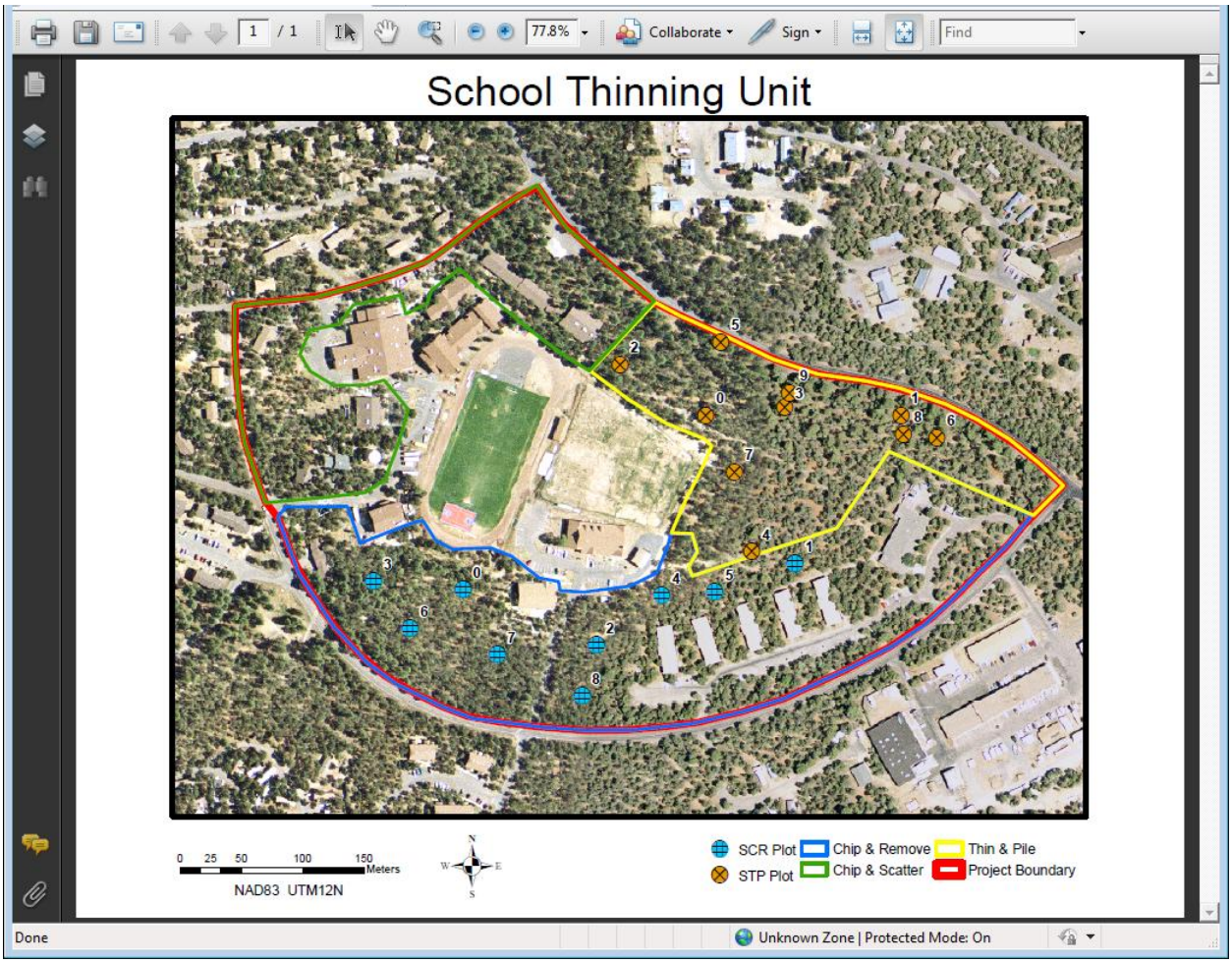
Students will symbolize each layer based on attributes of the layer. Data attribute documentation is at http://fia.fs.fed.us/library/database-documentation/ (Phase 3)



Grand Canyon Fire Analysis



Map provided by NPS with data points


School Thinning Unit
0 25 50 100 150 Meters
NAD83 UTM12N
N
W
E
S
SCR Plot
STP Plot
Chip & Remove
Chip & Scatter
Thin & Pile
Project Boundary