The Joint Fire Science Program (JFSP) & Fire Science Exchange Network

JFSP: Research Supporting Sound Decisions

www.firescience.gov

The Fire Science Exchange Network

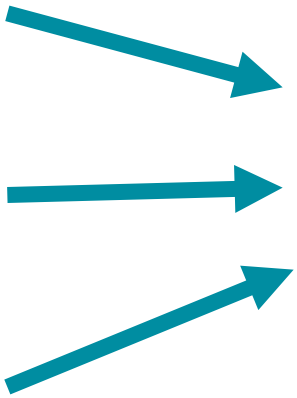
The Pacific Fire Exchange

Founding Partners:

HWMO
Hawaii Wildfire Management Organization

Forest Service U.S. Department of Agriculture
IPIF
Institute of Pacific Islands Forestry

University of Hawai'i
Cooperative Extension
University of Hawai'i at Mānoa
College of Tropical Agriculture and Human Resources



PFX
Pacific Fire Exchange

The Pacific Fire Exchange

Goal: Reduce wildfire threats to ecosystems and communities in the Pacific

- Facilitate knowledge exchange
- Enable collaborative relationships
- Leverage best available research

Products & Activities:

- Webinars
- Field Trips
- Workshops
- Fact Sheets
- Research Briefs
- Newsletter & Website

Visit us online!

www.PacificFireExchange.org
@PacificFireSci

Help us better serve you!

Complete the feedback survey at the end of the webinar

PFX
Pacific Fire Exchange

Mahalo!

Webinar: Land Cover Maps for Fire & Land Management

Matthew Lucas – UHM NREM

Thursday, November 9, 2017
2:00 PM 3:00 PM

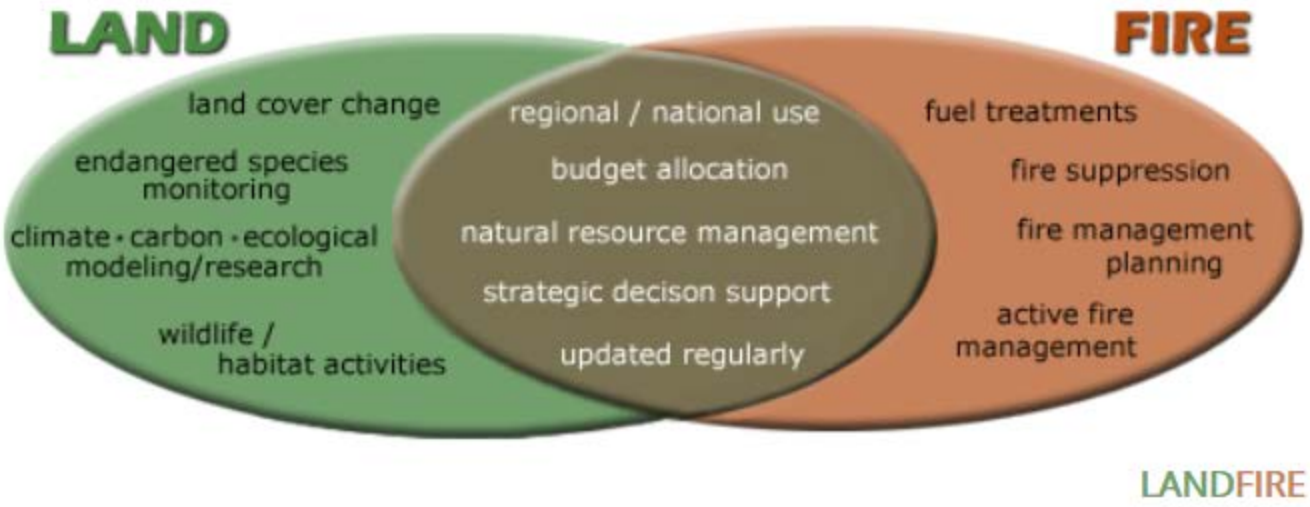
Overview

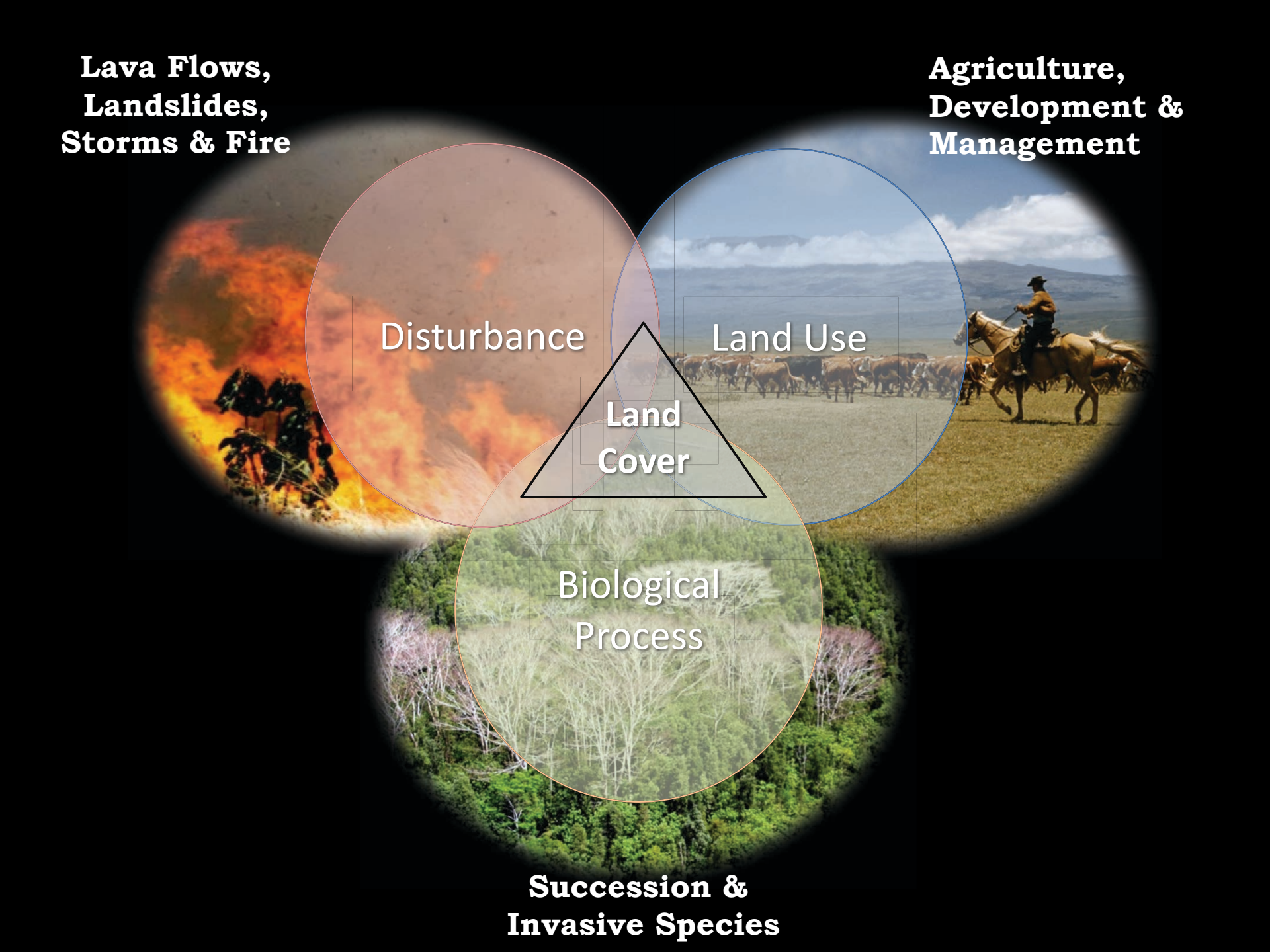
- Context Land Cover
- Overview of available vegetation and land cover GIS products for Hawaii and the US-Affiliated Pacific Islands
  - Benefits, attributes and intended uses of these products
  - Where you can access these products
- Introduction of a newly-developed, dynamic frational land cover product for Hawaii
  - Identification of possible areas and rates of land cover change that has occurred since 2000.
- Potential application of land cover products
- Discussion on the land cover product applications and interfaces

What we are ***not*** talking about *(mostly)…*

- **National** or **global** data
- New and historical satellite or aerial ***imagery***
- PhoDAR or LiDAR ***point clouds***
- ***Species ranges*** or location data
- Spatial ***climate*** data
- ***Fire*** & disturbance data
- Zoning, planning or ***land use*** data

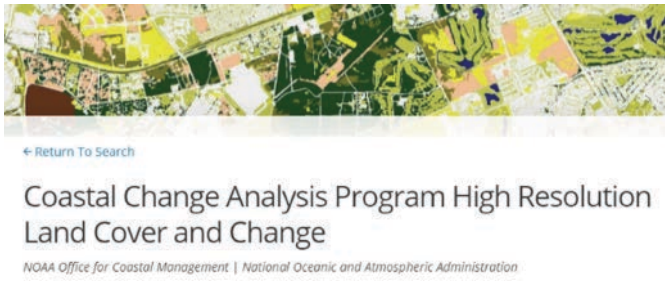
- **What is land cover? And why is it important?** Land cover is the types of features that cover the surface of the Earth
- **What is the difference between land cover and land use?** Land cover captures the physical state of land resources. Land use denotes how the land is being used.

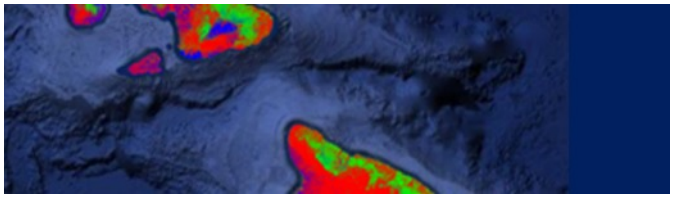



Lava Flows,
Landslides,
Storms & Fire
Agriculture,
Development &
Management
Disturbance
Land Use
Land
Cover
Biological
Process
Succession &
Invasive Species

Land Cover Data Products

- HI GAP analysis
- LANDFIRE
- NOAA CCAP
- Unmixed Fractional Landcover





USGS The National Gap Analysis (GAP)

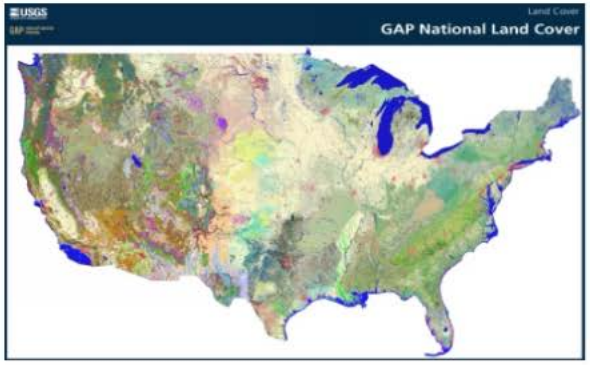
USGS
science for a changing world

USGS Home
Contact USGS
Search USGS

National Gap Analysis Program (GAP) | Land Cover Data Portal

Search this site... Go Sitemap

GAP HOME | LAND COVER HOME | VISION | VIEWER | DATA » | RESOURCES | NEWS | CONTACTS



Improving the nation's land cover data

The GAP national land cover data, based on the NatureServe Ecological Systems Classification, are the foundation of the most detailed, consistent map of vegetative associations ever available for the United States and will help facilitate the planning and management of biological diversity on a regional and national scale.

Learn more: Download Land Cover Factsheet »

Features

Gap Analysis of Ecological Systems

Landscape Conservation Cooperatives (LCCs) are newly defined conservation initiative units that promote conservation-science partnerships between USFWS, USGS, other federal agencies, states, tribes, NGOs, universities, and other stakeholders. There are 16 defined within... Learn more >>

Land Cover News

- Name change for GAP's National Land Cover Dataset >>
- Remap Strategy Team >>
- NLCD 2011 >>
- Coming Together for an All-Lands Dataset to Support Wildfire and Wildlife Conservation Planning >>

Access Land Cover Data

GET DATA Land Cover — GAP ANALYSIS PROGRAM

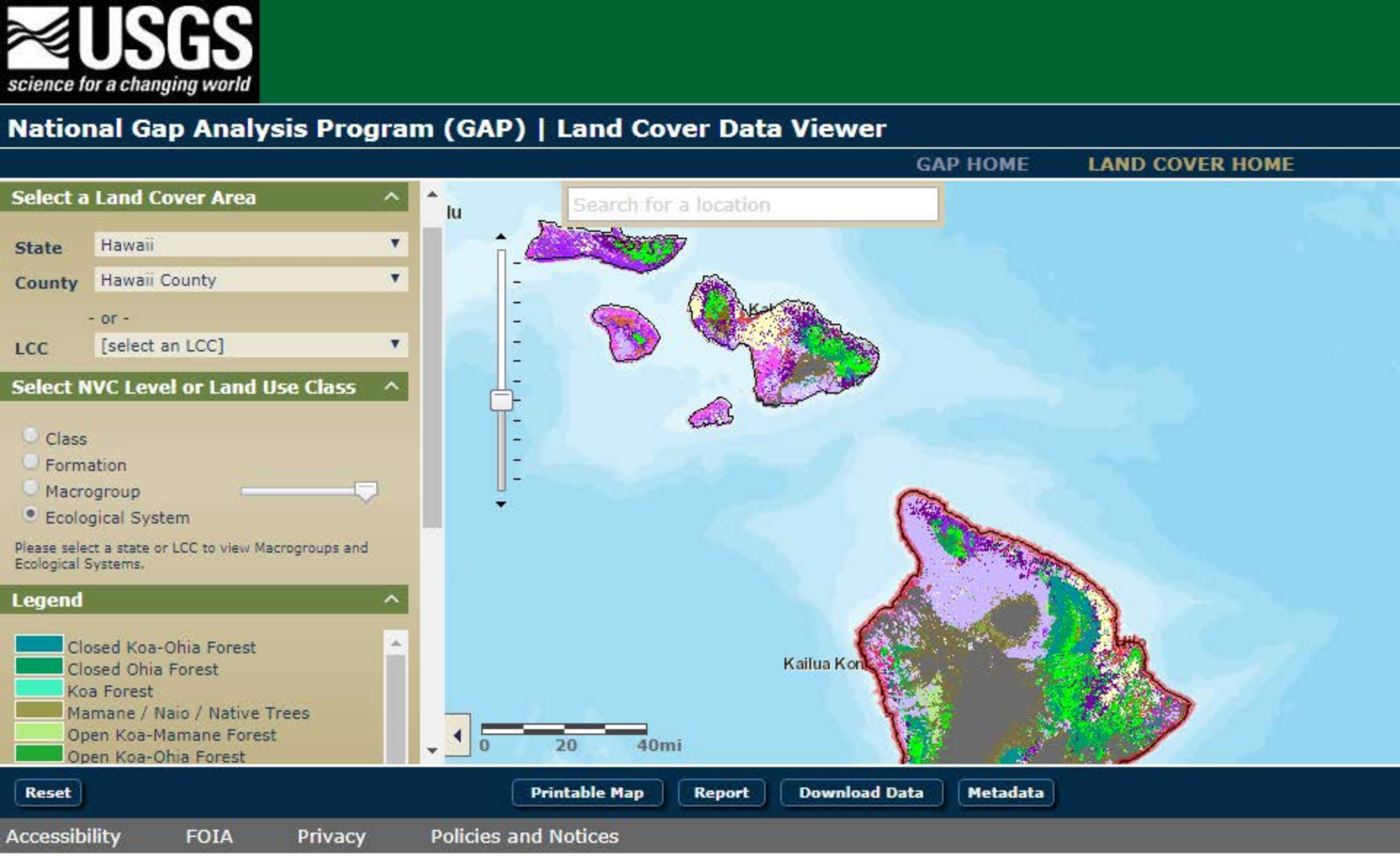
GO TO Land Cover Viewer — GAP ANALYSIS PROGRAM

"GAP works to ensure that common species – those that are not officially endangered – remain common by identifying those species and plant communities that are not adequately represented in existing conservation lands."

Land Cover Data Products: HI GAP analysis

- Attributes
  - Main Hawaiian Islands
  - 2001
  - LANDSAT
  - 48+ Ecological Based Cover Classes
  - 30m resolution
- Intended Uses:
  - Ecological Mapping & Conservation Planning
- Benefits:
  - Ecologically Relevant & Widely Used
- Limitations:
  - Only one time-step & 17 years old
- Data Access:
  - Online Viewer and Download

  https://gapanalysis.usgs.gov/gaplandcover



https://gis1.usgs.gov/csas/gap/viewer/land_cover/Map.aspx

LANDFIRE – Landscape Fire and Resource Management

"LF's mission is to provide agency leaders and managers with a common "all-lands" data set of vegetation and wildland fire/fuels information for strategic fire and resource management planning and analysis."

Land Cover Data Products: HI LANDFIRE

- Attributes
  - Main Hawaiian Islands, American Samoa, Guam, CNMI, FSM, Palau & Marshall Islands
  - **2001,08,12,14**
  - Mostly LANDSAT Data with fire/change additions
  - 25+ Vegetation & Fuels Based % Cover Classes
  - 30m resolution
- Intended Uses:
  - Fire and disturbance mapping, management, & modeling
- Benefits:
  - Several time steps, most coverage for US affiliated islands, widely used, made for land & fire MGMT, built to plug into fire models
- Limitations:
  - Opportunistic change and assumed fire/change outcomes (*strong and rapid change*)
- Data Access:
  - Online Viewer and Download

  https://www.landfire.gov/index.php

Vegetation

LANDFIRE (LF) **existing** vegetation layers describe the following elements: existing vegetation type (EVT), existing vegetation canopy cover (EVC), and existing vegetation height (EVH). These layers are created using predictive landscape models based on extensive field-referenced data, satellite imagery and biophysical gradient layers using classification and regression trees. LF **potential** vegetation layers describe the following elements: bio-physical settings (BPS) and environmental site potential (ESP). These layers are created using predictive landscape models based on extensive field-referenced data and biophysical gradient layers using classification and regression trees.

Products

Vegetation Product Alerts ▼

Existing Vegetation	Potential Vegetation
Existing Vegetation Type - complexes of plant communities Existing Vegetation Cover - vertically projected percent cover of the live canopy layer for a specific area Existing Vegetation Height - average height of the dominant vegetation Existing Vegetation Type, Cover, and Height agree by lifeform for every pixel. Use existing vegetation layers together for a more complete representation of the vegetated landscape. ***Seasonal*** Provisional Modeling Dynamic Fuels with an Index System (MoD-FIS) - seasonally modulated fuel model data	Biophysical Settings - vegetation that may have been dominant on the landscape pre Euro-American settlement Biophysical Settings Models and Descriptions (non-spatial) - state-and-transition models representing pre-settlement reference conditions for each biophysical setting Environmental Site Potential - vegetation that could be supported at a given site based on the biophysical environment

Other

LF Reference Database (LFRDB) - consists of vegetation and fuel data from geo-referenced sampling units nationwide

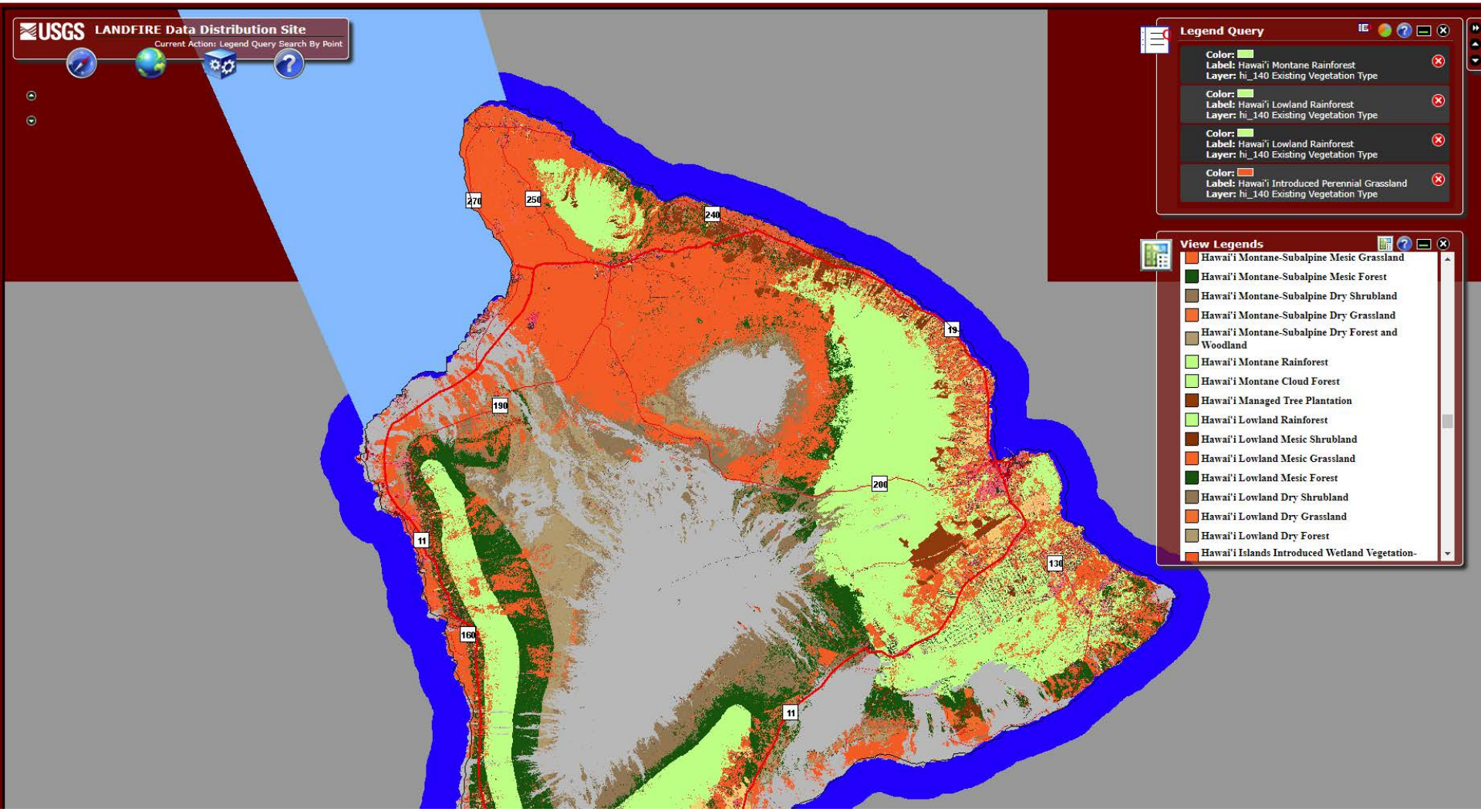
Land Cover Data Products:
HI LANDFIRE

Data Products Distribution Table

Filter by: MOSAIC downloads | Data Distribution Site | landfire.gov | Clear Filter

Download full mosaics of each layer

Theme	Product Name	Abbreviation	National*			LF 2001			LF 2008			LF 2010				LF 2012				LF 2014			
			LF 1.0.0			LF 1.0.5			LF 1.1.0			LF 1.2.0				LF 1.3.0				LF 1.4.0			
			US	AK	HI	US	AK	HI	US	AK	HI	US	AK	HI	IA	US	AK	HI	IA	US	AK	HI	IA
Reference	LF Reference Database	LFRDB	xdb	xdb	xdb	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	--	n/c	n/c	n/c	--	n/c	n/c	n/c	--
	Public Events Geodatabase_1999_YEAR		--	--	--	--	--	--							--				--				--
	Forest Vegetation Simulator Ready Database	FVSRDB	--	--	--	--	--	--	--	--	--	--	--	--	--	xdb	xdb	xdb	--	--	--	--	--
Disturbance	Disturbance (year)	DISTYEAR	--	--	--	--	--	--			--			--	--				--				--
	Vegetation Disturbance	VDISTYEAR	--	--	--	--	--	--							--				--				--
	Vegetation Transition Magnitude	VTMYEAR	--	--	--	--	--	--	--	--	--			--	--				--				--
	Forest Vegetation Transitions Database	FVTDB	--	--	--	--	--	--	--	--	--	--	--	--	--	xdb	xdb	xdb	--	n/c	n/c	n/c	--
	Non-forest Vegetation Transitions Database	NFVTDB	--	--	--	--	--	--	--	--	--	--	--	--	--	xdb	xdb	xdb	--	n/c	n/c	n/c	--
	Fuel Disturbance	FDISTYEAR	--	--	--	--	--	--							--				--				--
	Forest Vegetation Simulator Disturbance Database	FVSDBB	--	--	--	--	--	--	--	--	--	--	--	--	--	xdb	xdb	xdb	--	n/c	n/c	n/c	--
Vegetation	Biophysical Settings	BPS	x	x	x														--				--
	Environmental Site Potential	ESP	x	x	x										–				--				--
	Existing Vegetation Cover (MoD-FIS)	EVC	x	x	x														--				--
	Existing Vegetation Height (MoD-FIS)	EVH	x	x	x														--				--
	Existing Vegetation Type	EVT	x	x	x														--				--
	Biophysical Settings Models and Descriptions		xdb	xdb	xdb	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	--	--	--	--	--
Fuel	13 Anderson Fire Behavior Fuel Models	FBFM13	x	x	x														--				--
	40 Scott and Burgan Fire Behavior Fuel Models (MoD-FIS)	FBFM40	x	x	x														--				--
	Canadian Forest Fire Danger Rating System	CFFDRS	--	x	--	--	--	--	--	--	--	--		--	--	--		--	--	--		--	--
	Forest Canopy Bulk Density	CBD	x	x	x														--				--
	Forest Canopy Base Height	CBH	x	x	x														--				--
	Forest Canopy Cover	CC	x	x	x														--				--
	Forest Canopy Height	CH	x	x	x														--				--
	Fuel Characteristic Classification System Fuelbeds	FCCS	x	x	--							--	--	--	--	--	--	--	--				--
	Fuel Loading Models	FLM	x	--	--						--	--	--	--	--	--	--	--	--	--	--	--	--


USGS
LANDFIRE Data Distribution Site
Current Action: Legend Query Search By Point
Legend Query
Color:
Label: Hawai'i Montane Rainforest
Layer: hi_140 Existing Vegetation Type
Color:
Label: Hawai'i Lowland Rainforest
Layer: hi_140 Existing Vegetation Type
Color:
Label: Hawai'i Lowland Rainforest
Layer: hi_140 Existing Vegetation Type
Color:
Label: Hawai'i Introduced Perennial Grassland
Layer: hi_140 Existing Vegetation Type
View Legends
Hawai'i Montane-Subalpine Mesic Grassland
Hawai'i Montane-Subalpine Mesic Forest
Hawai'i Montane-Subalpine Dry Shrubland
Hawai'i Montane-Subalpine Dry Grassland
Hawai'i Montane-Subalpine Dry Forest and Woodland
Hawai'i Montane Rainforest
Hawai'i Montane Cloud Forest
Hawai'i Managed Tree Plantation
Hawai'i Lowland Rainforest
Hawai'i Lowland Mesic Shrubland
Hawai'i Lowland Mesic Grassland
Hawai'i Lowland Mesic Forest
Hawai'i Lowland Dry Shrubland
Hawai'i Lowland Dry Grassland
Hawai'i Lowland Dry Forest
Hawai'i Islands Introduced Wetland Vegetation-
270
250
240
190
200
160
11
11
130

NEWS!

USGS
science for a changing world

National Gap Analysis Program (GAP) | Land Cover Data Portal

GAP HOME | LAND COVER HOME | VISION | VIEWER | DATA » | RESOURCES | NEWS | CONTACTS

Coming Together for an All-Lands Dataset to Support Wildfire and Wildlife Conservation Planning

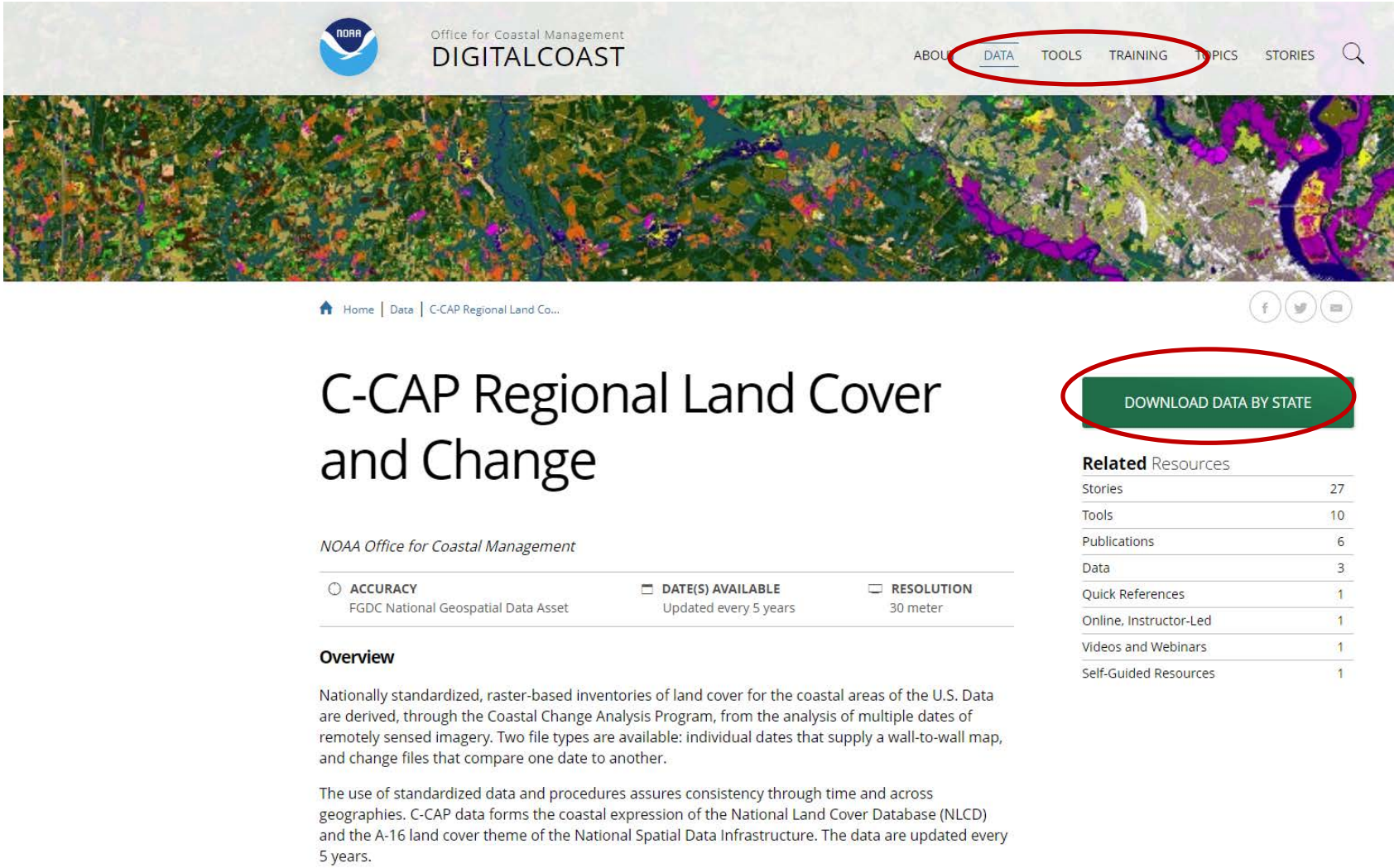
Tweet

Published Jun 2, 2015 | Tagged Feature, Highlight

The National Gap Analysis (GAP) and Landscape Fire and Resource Management Planning Tools (LANDFIRE) Programs are teaming up to deliver detailed land cover maps that support wildland fire and species conservation planning for the nation. *The All-Bird Bulletin*(Spring 2015), published by the North American Bird Conservation Initiative, features an article describing GAP and LANDFIRE coordinated land cover mapping efforts: The All-Bird Bulletin.

The Gap Analysis Program has been working directly with LANDFIRE for several years to develop a strategy toward a **2016 remap of the vegetation for the nation**. Once the remap is completed, the **biennial updates will provide a time series** of detailed vegetation data that will **allow for analysis of vegetation changes over time**, a valuable resource for studies on global climate change, fire dynamics, and wildlife management.

CCAP – Coastal Change Analysis Program

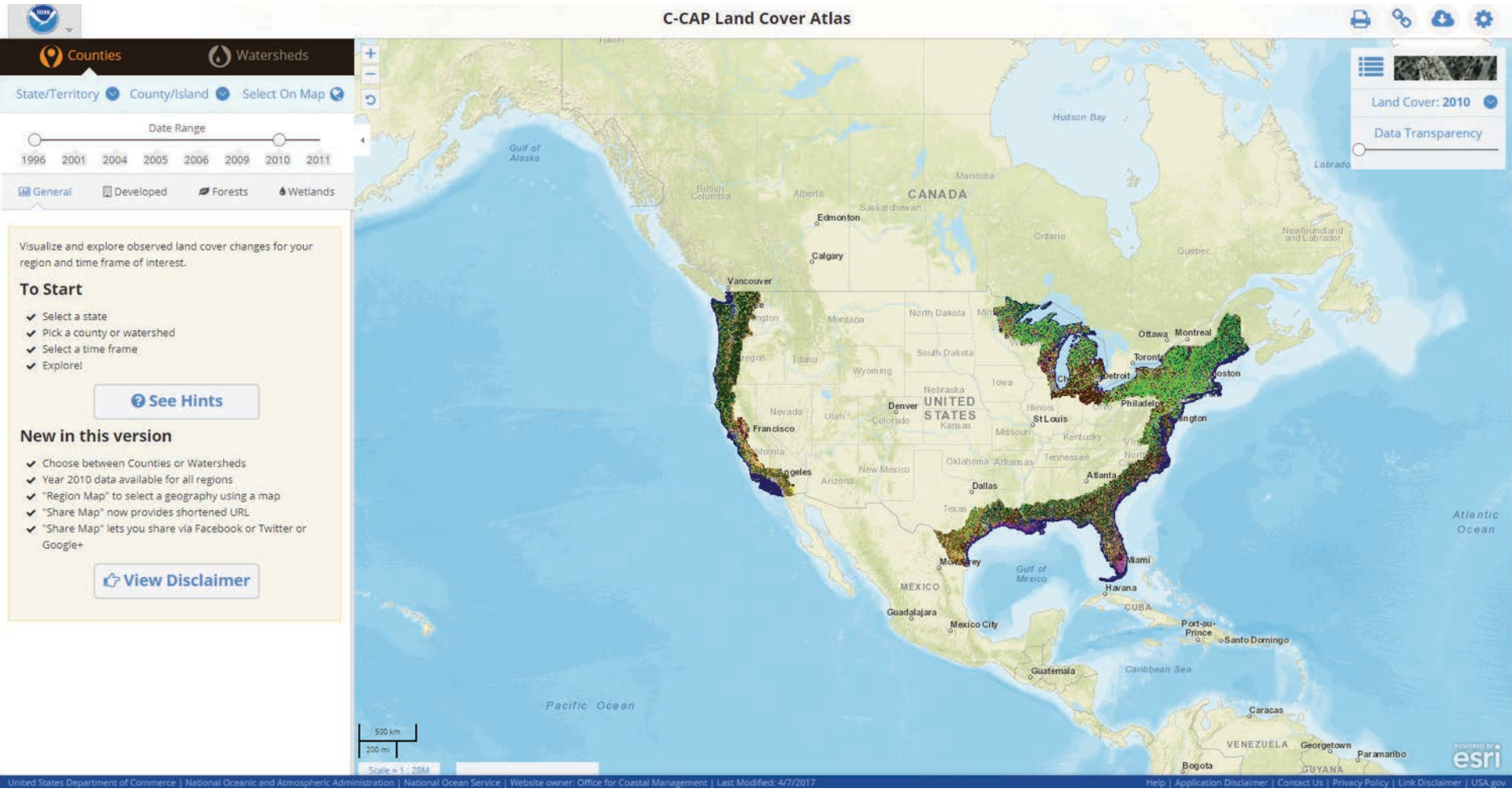


C-CAP land cover data and maps cover intertidal areas, wetlands, and adjacent uplands. NOAA makes more detailed distinctions between wetland categories, such as estuarine (salt) vs. palustrine (freshwater) wetlands. C-CAP is considered the coastal expression of the national database. Updated every five years allows for comparing years allows CCAP to document land cover changes over time.

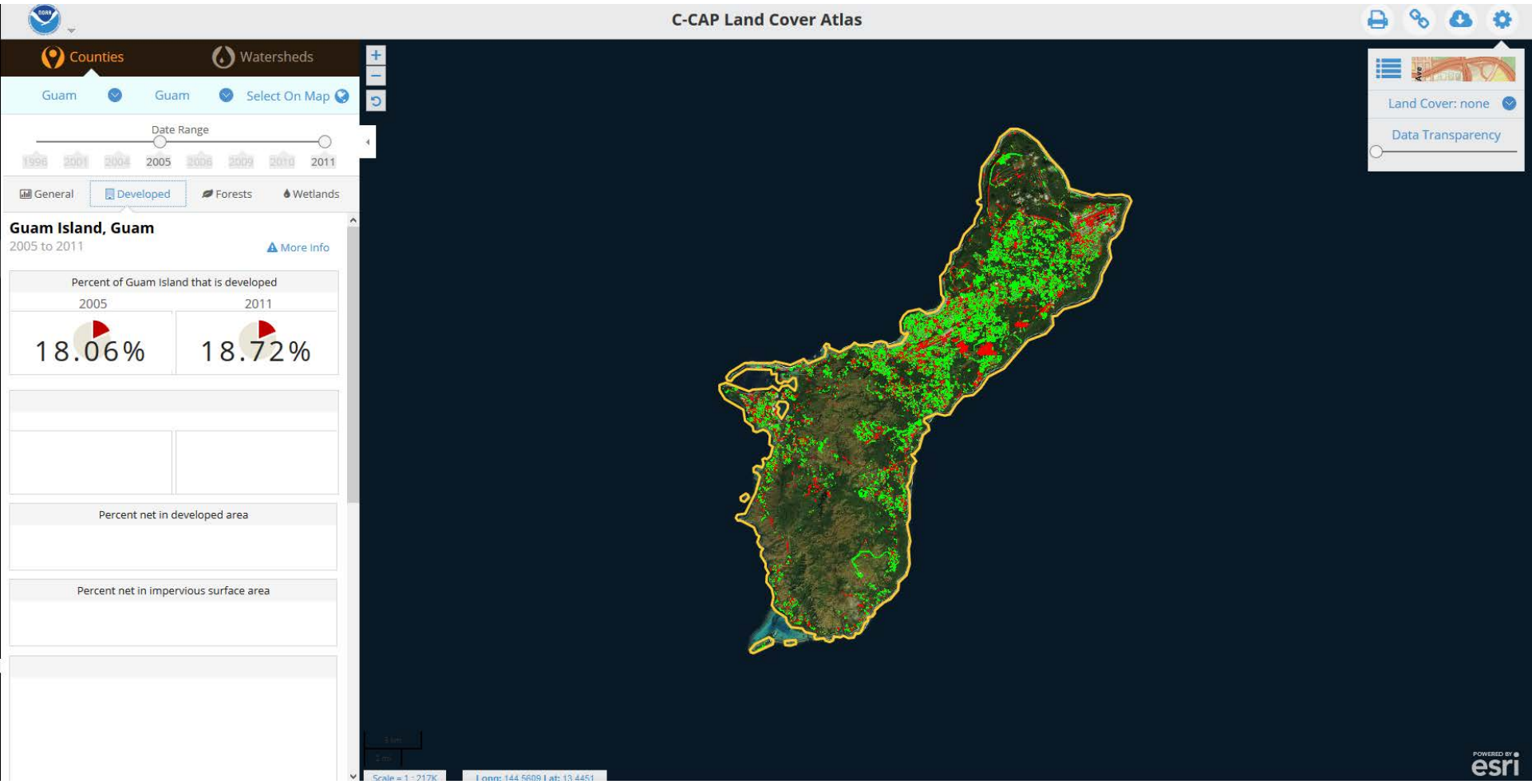
Land Cover Data Products: NOAA CCAP

- Attributes
  - Main Hawaiian Islands, American Samoa, Guam, CNMI
  - **1946** *(CNMI)* **1992, 2001, 2005, 2010**
  - LANDSAT, QuickBird™, WorldView™
  - 25+ Cover Classes with Wetland Vegetation Focus
  - 30m resolution
  - 2.5m high resolution (2005-2010)
  - Change Highlighted and available
- Intended Uses:
  - Coastal Change and hydrological wetland / coastal mapping
- Benefits:
  - Several time steps, widely used for urban / coastal / wetland change
- Limitations:
  - Change focused on coastal areas with most impacts being estuary focussed
- Data Access:

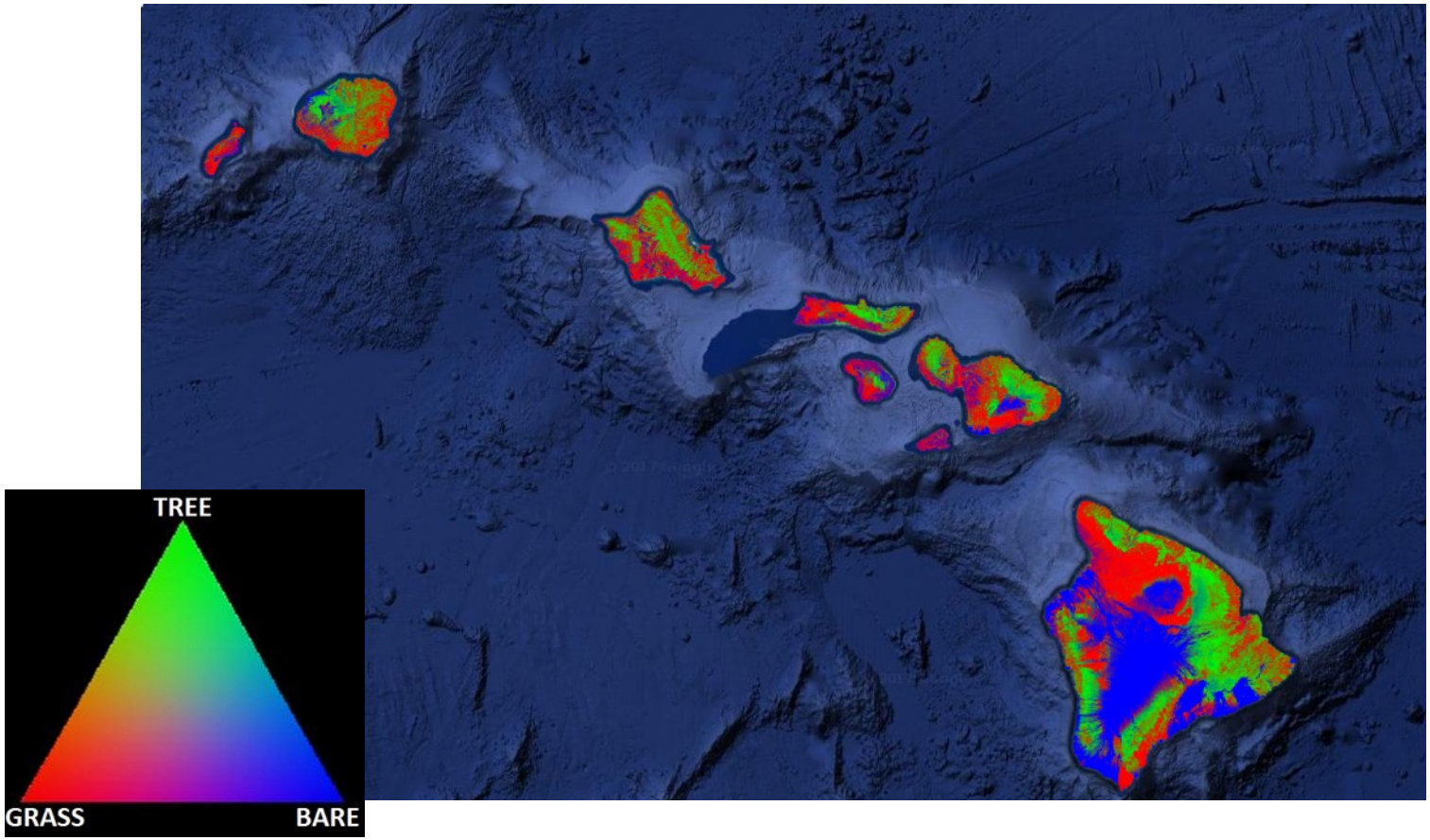
  Info: https://coast.noaa.gov/digitalcoast/data/ccapregional.html
  Online: https://coast.noaa.gov/ccapatlas/
  Download: https://coast.noaa.gov/ccapftp


C-CAP Land Cover Atlas
Counties
Watersheds
State/Territory
County/Island
Select On Map
Date Range
1996 2001 2004 2005 2006 2009 2010 2011
General
Developed
Forests
Wetlands
Visualize and explore observed land cover changes for your region and time frame of interest.
To Start
Select a state
Pick a county or watershed
Select a time frame
Explore!
See Hints
New in this version
Choose between Counties or Watersheds
Year 2010 data available for all regions
"Region Map" to select a geography using a map
"Share Map" now provides shortened URL
"Share Map" lets you share via Facebook or Twitter or Google+
View Disclaimer
Land Cover: 2010
Data Transparency
CANADA
UNITED STATES
MEXICO
CUBA
Hudson Bay
Gulf of Alaska
Gulf of Mexico
Caribbean Sea
Pacific Ocean
Atlantic Ocean
Vancouver
Edmonton
Calgary
Montreal
Ottawa
Toronto
Detroit
Boston
Philadelphia
Denver
St Louis
Atlanta
Dallas
Miami
Havana
Guadalajara
Mexico City
Port-au-Prince
Santo Domingo
Guatemala
Caracas
Georgetown
Paramaribo
Bogota
VENEZUELA
GUYANA
500 km
200 mi
United States Department of Commerce | National Oceanic and Atmospheric Administration | National Ocean Service | Website owner: Office for Coastal Management | Last Modified: 4/7/2017
Help | Application Disclaimer | Contact Us | Privacy Policy | Link Disclaimer | USA.gov


C-CAP Land Cover Atlas
Counties
Watersheds
Guam
Guam
Select On Map
Date Range
1996
2001
2004
2005
2006
2009
2010
2011
General
Developed
Forests
Wetlands
Guam Island, Guam
2005 to 2011
Percent of Guam Island that changed
9.03%
Distribution of land cover by type
2005
2011
IMP
OSD
GRS
SCB
BAR
WTR
AGR
FOR
WDW
EMW
Land cover classes
0
25
50
75
100
Square miles
Distribution of change (losses & gains) by land cover
Loss
Gain
IMP
OSD
GRS
Land Cover: none
Data Transparency
Scale = 1 : 217K
Long: 144.3164 Lat: 13.6533
POWERED BY esri


C-CAP Land Cover Atlas
Counties
Watersheds
Guam
Guam
Select On Map
Date Range
1996 2001 2004 2005 2006 2009 2010 2011
General
Developed
Forests
Wetlands
Guam Island, Guam
2005 to 2011
More Info
Percent of Guam Island that is developed
2005
2011
18.06%
18.72%
Percent net in developed area
Percent net in impervious surface area
Land Cover: none
Data Transparency
Scale = 1 : 217K
Long: 144.5609 Lat: 13.4451
POWERED BY esri

Unmixed Fractional Cover



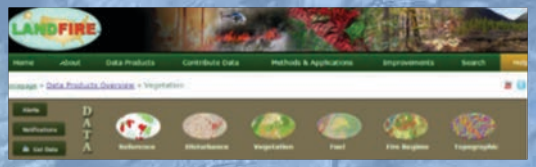
Unmixed fractional cover project has produced statewide annual maps from 1999 to 2016 of proportional percent cover of forest, grass and bare earth, from archived LANDSAT imagery. Change detection was preformed using statistical trend analysis and was used to evaluate statewide extent, rates, and outcomes of land cover change intended to be attributed to a spatial land management history.

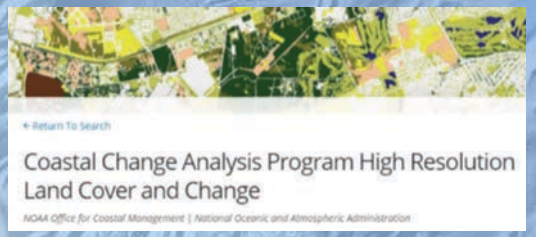
Land Cover Data Products: Unmixed Fractional Cover

- Attributes
  - Main Hawaiian Islands
  - **Annual 1999 -2016**
  - LANDSAT
  - 3 Proportional % Cover Classes
    - Grass/Fine Veg : Forest/Woody/Coarse Veg : Bare/Un-Veg
  - 30m resolution (sub – pixel)
  - Change Detection with Rates, Extent, and Trajectory
- Intended Uses:
  - Land Use and Management Cover Outcomes
- Benefits:
  - 16 Annual Steps, Sub-Pixel, Transition Rates, Statistical Trend Approach
- Limitations:
  - Still in BETA testing & Lacks details on species composition
- Data Access:
  - Download and View: *2018 Release!*
  - EMAIL: *mplucas@hawaii.edu*

Hawai`i Land Cover Products

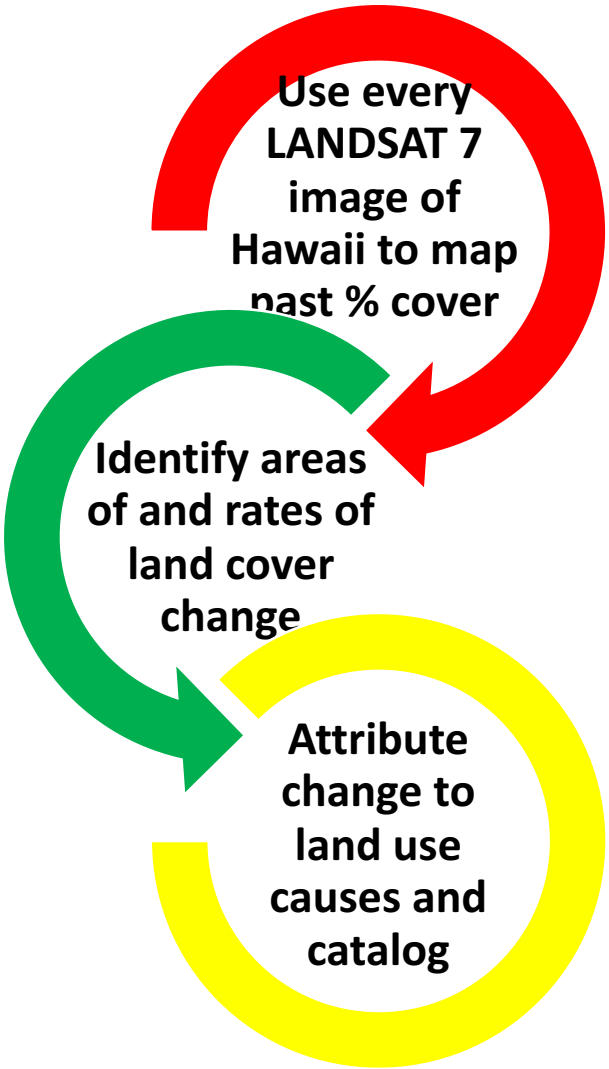
- Multiple LC Products for Hawaii
- Temporal snapshot(s)
- Cover is discrete (ie: class types)
- Classes can be subjective based on intended use

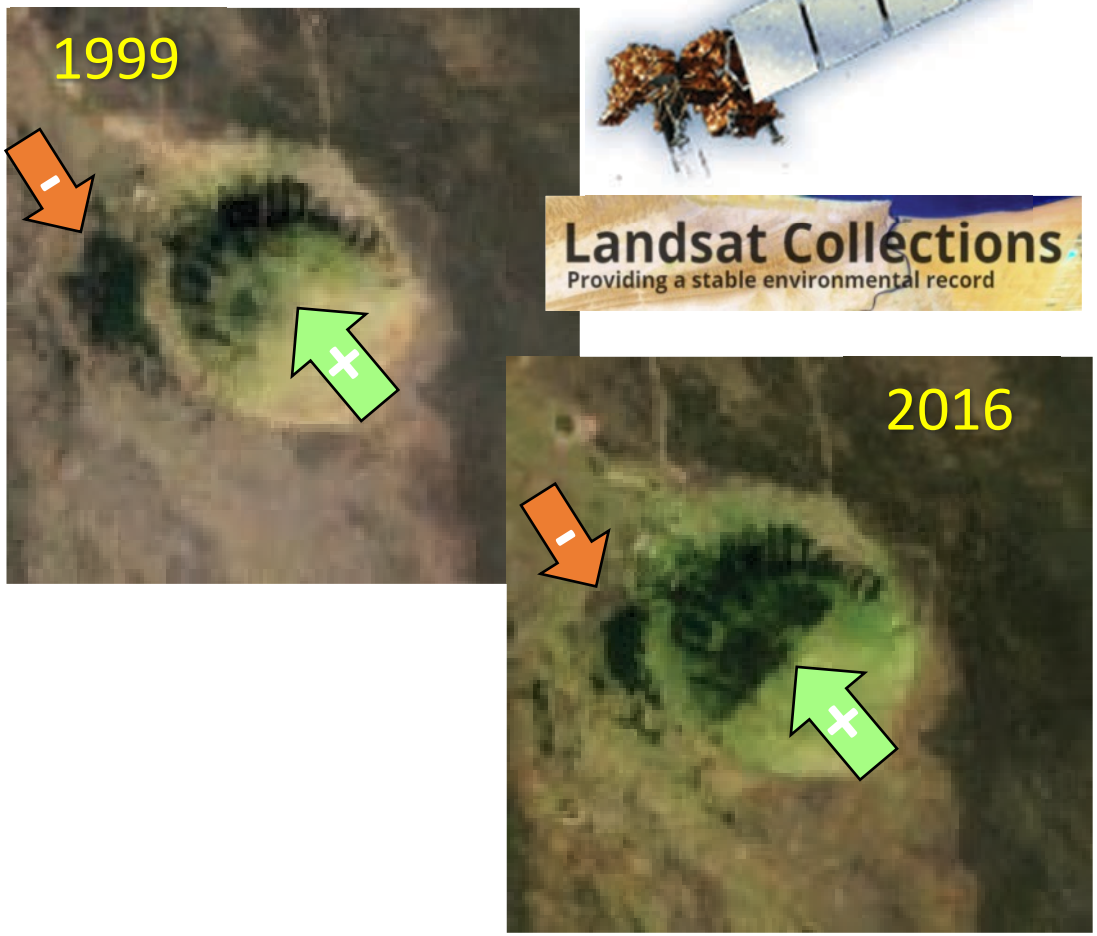




USGS
science for a changing world
National Gap Analysis Program (GAP)

A new dynamic approach to quantitative mapping land cover change from 1999 – 2016



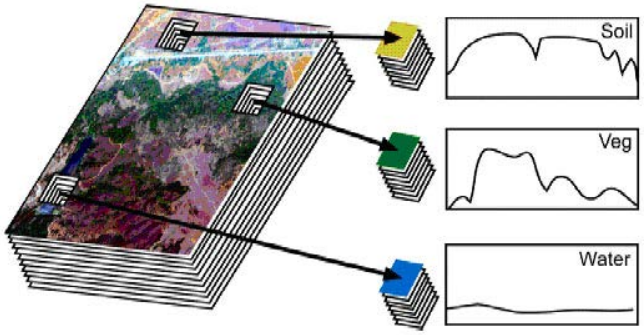


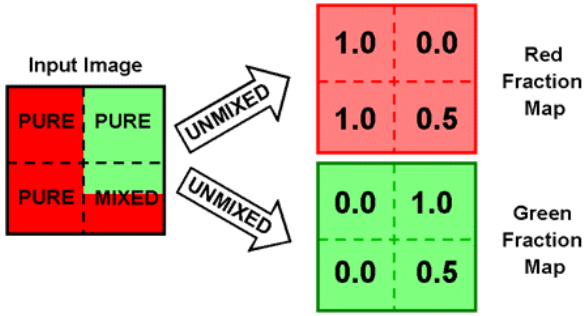
Google Earth Engine

> 200 public datasets | Entire LANDSAT collection | Prebuilt Algorithms | > 5 petabytes of data

Cloud Based + Colocated Data + Super Computer Computation

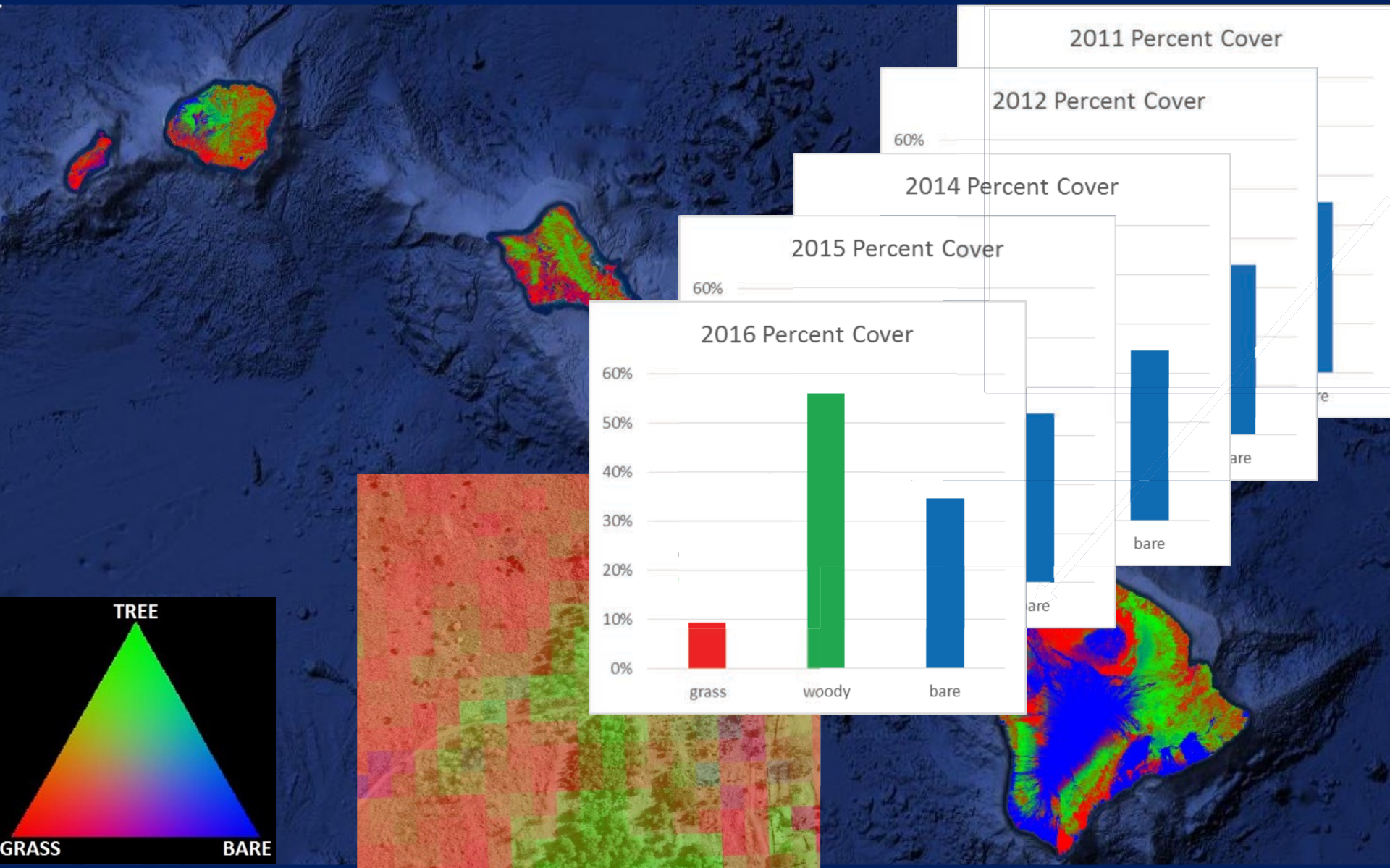
Need a method for estimating past & current amounts of vegetation/cover to statistically quantify change



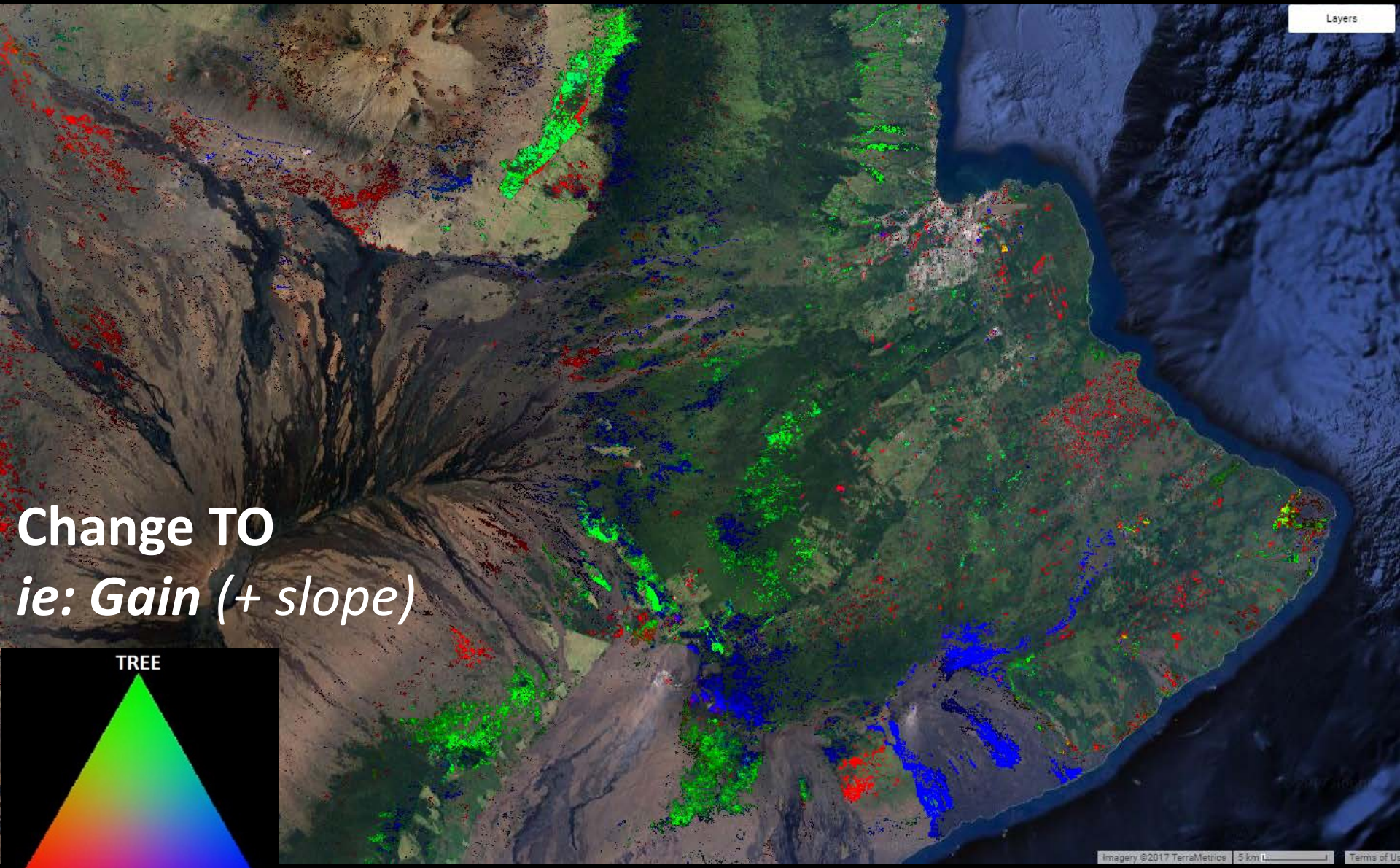


$$REF_{pix} = (Proportion_x * REF_x) + (Proportion_y * REF_y) + (Proportion_z * REF_z)$$

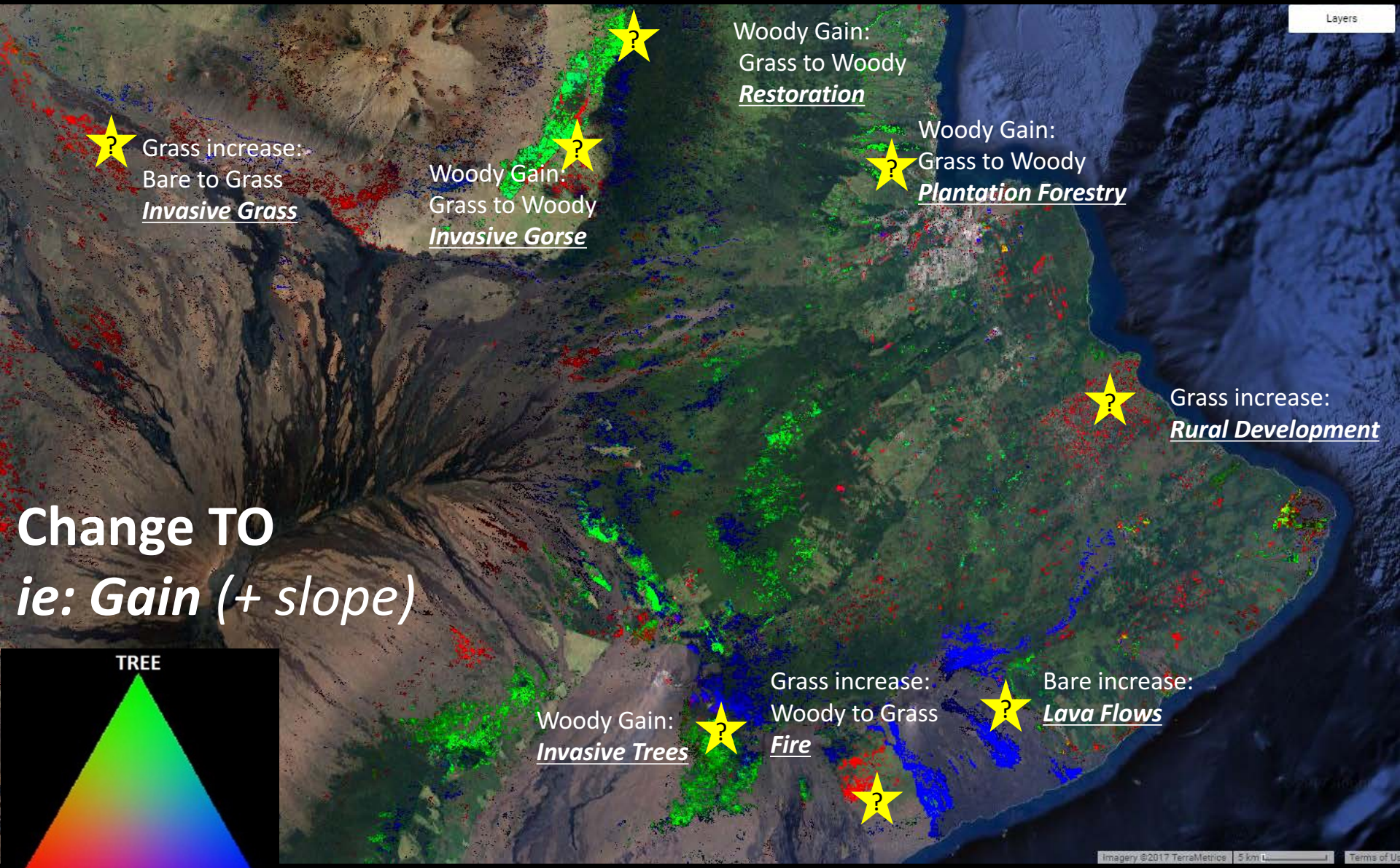
Spectral Unmixing - Returns sub-pixel proportional estimates of each endmember (*class*)


2011 Percent Cover
2012 Percent Cover
60%
2014 Percent Cover
2015 Percent Cover
60%
2016 Percent Cover
60%
50%
40%
30%
20%
10%
0%
grass
woody
bare
bare
TREE
GRASS
BARE

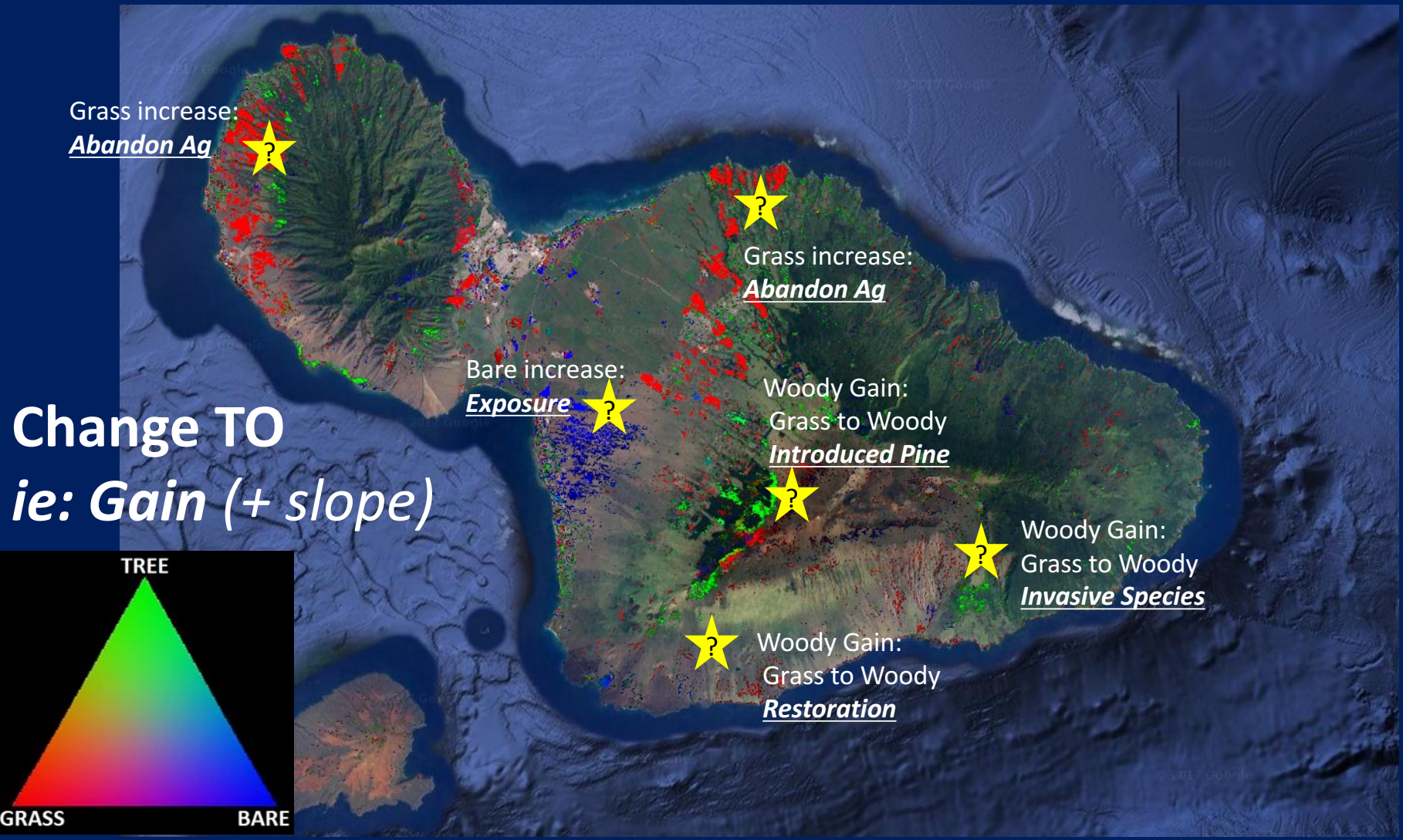
Where is change occurring?



Where is change occurring?

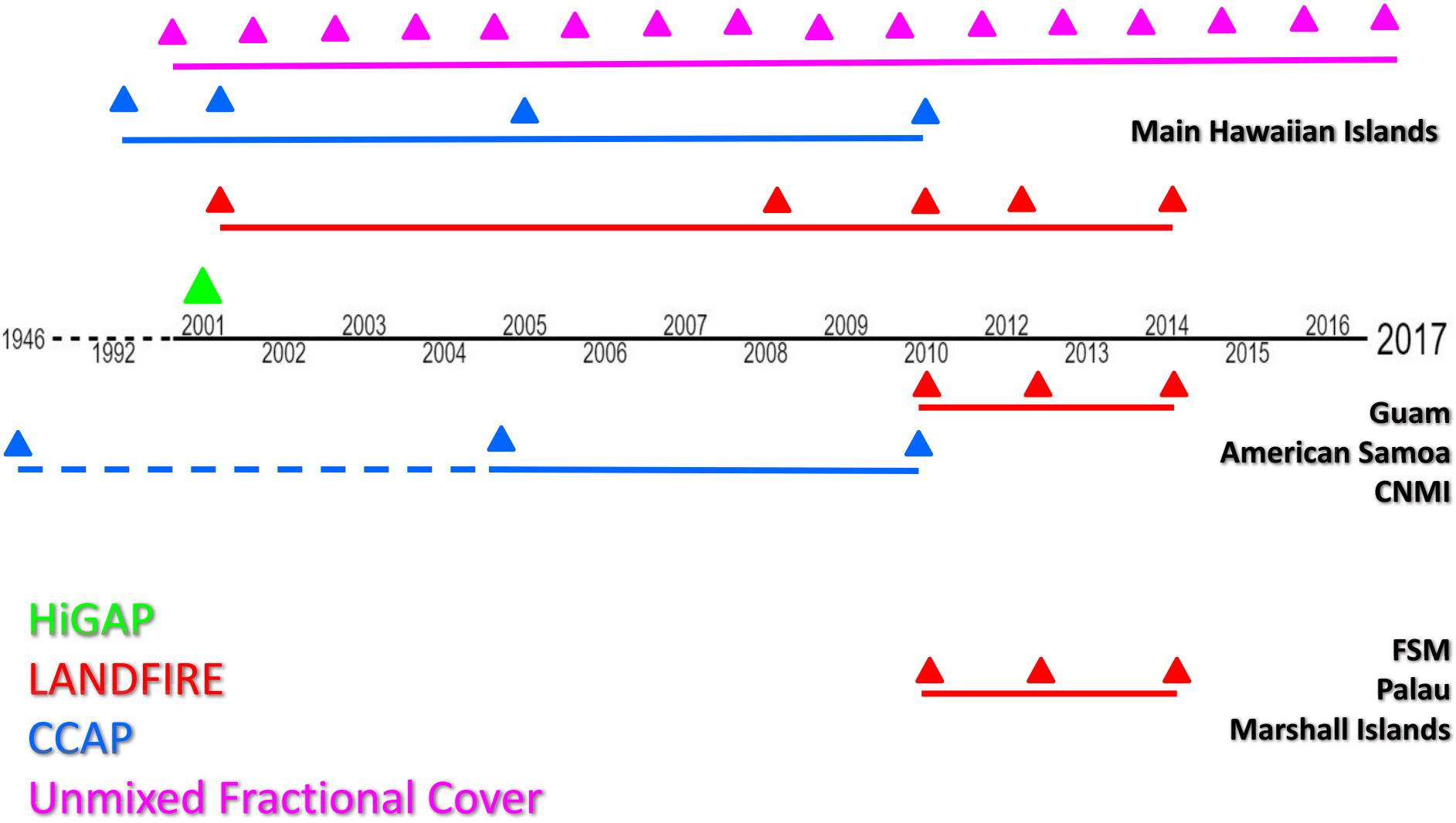


Statewide Land Cover Transitions

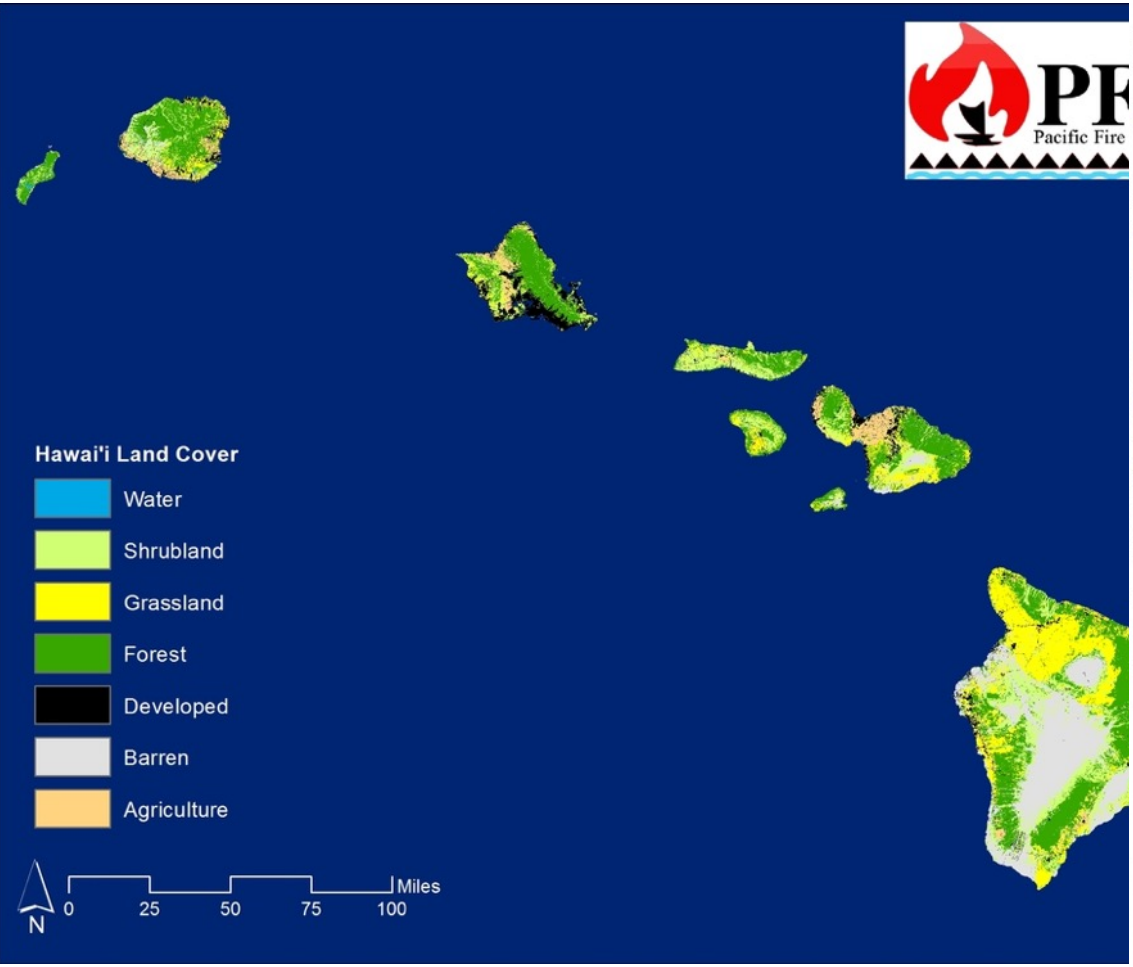


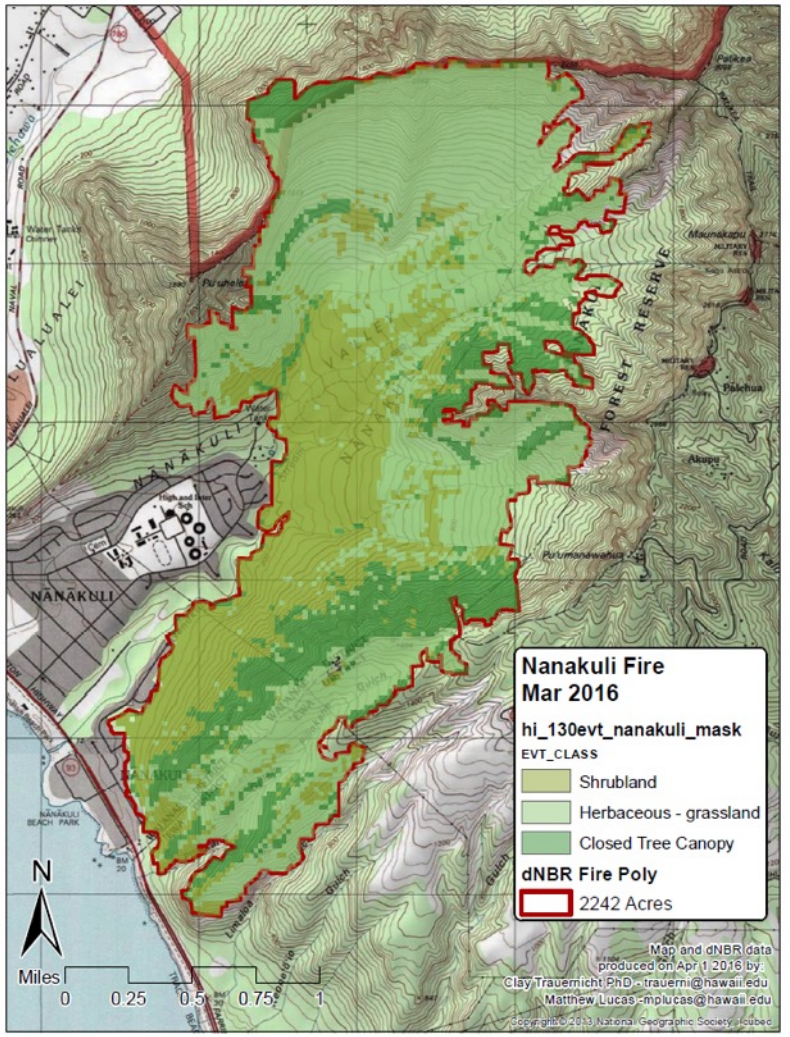
https://code.earthengine.google.com/

Land Cover Data Products: Temporal Range & Coverage Dates

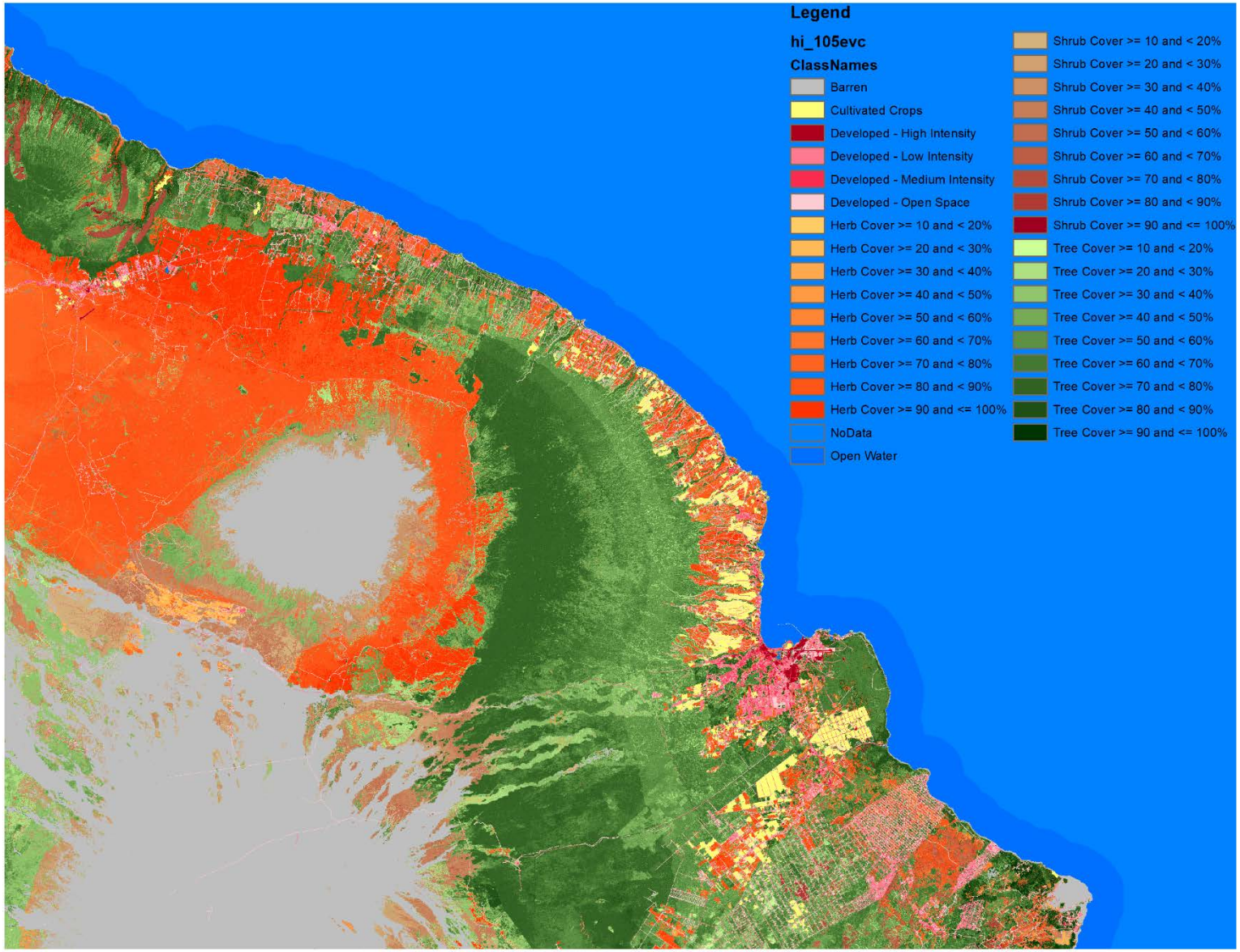


Land Cover Potential Applications: Maps

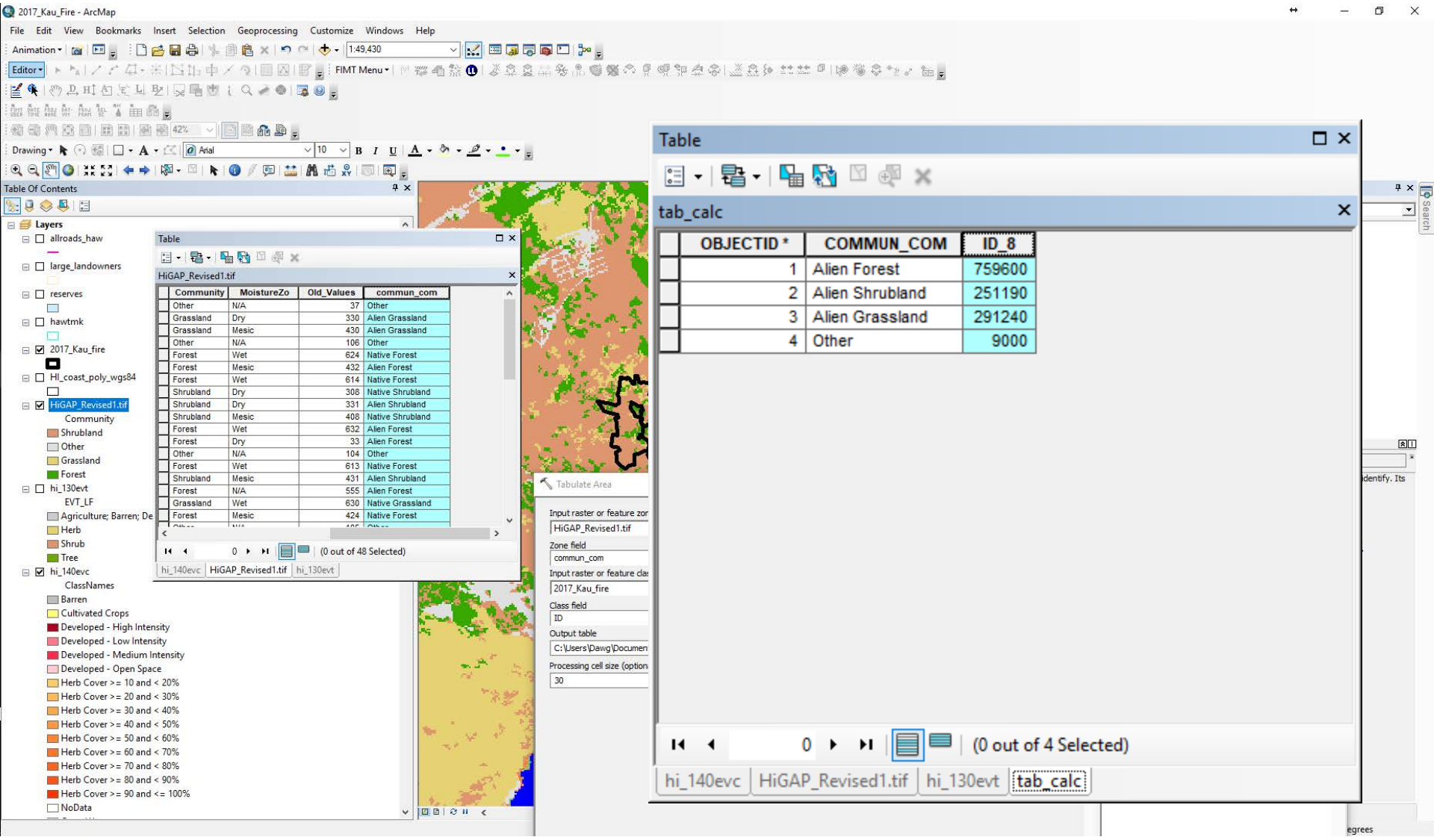




Land Cover Potential Applications: Fuels Mapping



Land Cover Potential Applications: Area Calculation



Office for Coastal Management
DIGITALCOAST

and the A-16 land cover theme of the National Spatial Data Infrastructu
5 years.

Featured Resources

- Land Cover Atlas — Online viewer makes it easier to explore land c

Additional Information

× Basics

- C-CAP Handout
- Frequently Asked Questions
- C-CAP Classification Scheme and Class Definitions
- C-CAP Mapping Boundary (shp file)

× Technical Support

- C-CAP ArcGIS Legend
- Applying the C-CAP Legend in ArcGIS
- How to Clip Land Cover in ArcGIS
- Excel worksheets for basic analysis of change data

Clipping Land Cover Data to an Area of Interest in ArcGIS 10.x

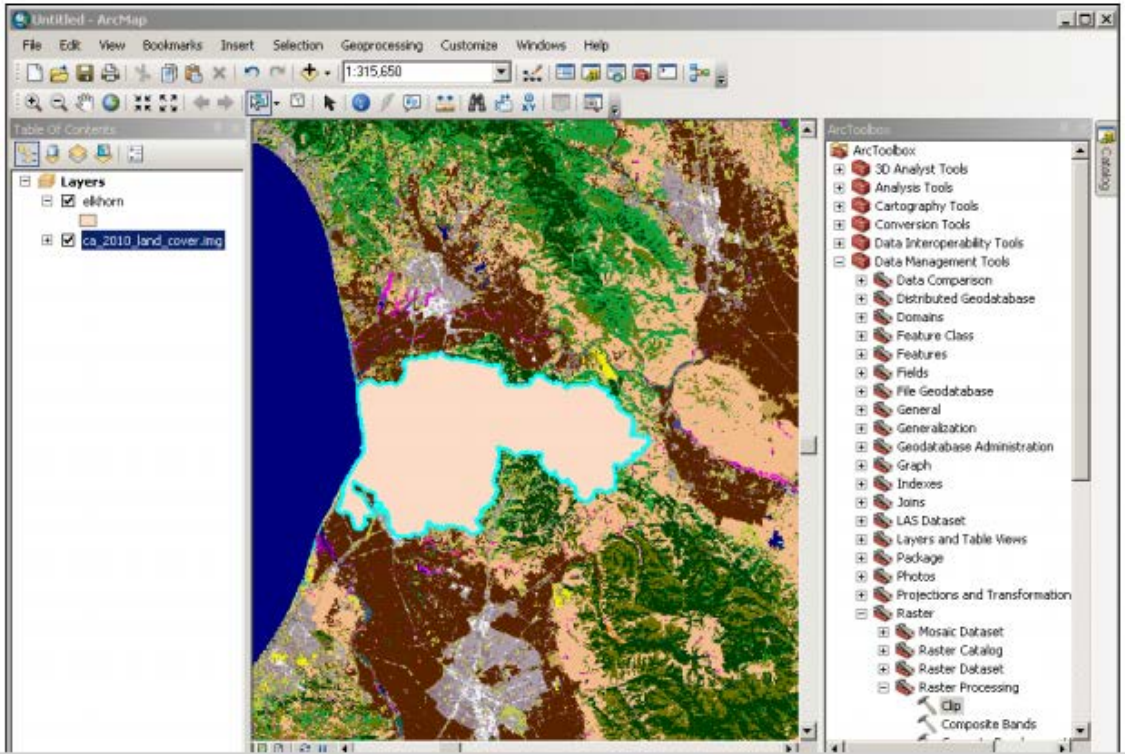
Coastal Change Analysis Program (C-CAP)

NOAA Coastal Services Center
(843) 740-1200
www.csc.noaa.gov

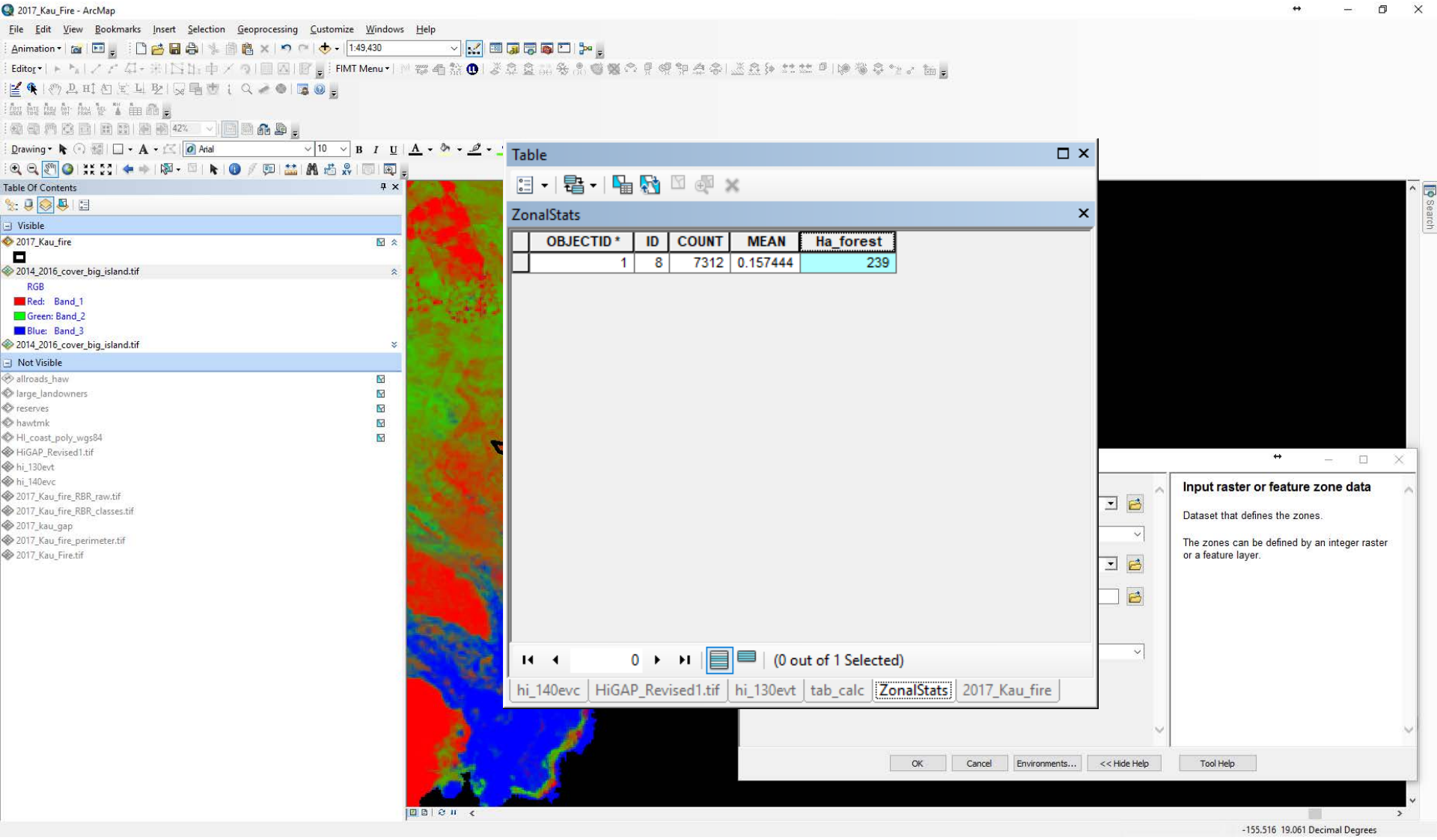
Clip (Basic ArcGIS)

Basic ArcGIS can only clip a raster to the geometry of an area of interest from a vector polygon.

1. Identify raster land cover data.
2. Identify the feature (vector) boundary for the area of interest.



Land Cover Potential Applications: Fractional Cover Assessment



Discussion

- Input on the best land cover product applications
- Interfaces for different management uses
- Comments or knowledge about LC products