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LANDFIRE Existing Vegetation Cover and Height

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[3]SGT, Inc., contractor to USGS EROS, work performed under USGS contract G10PD00044

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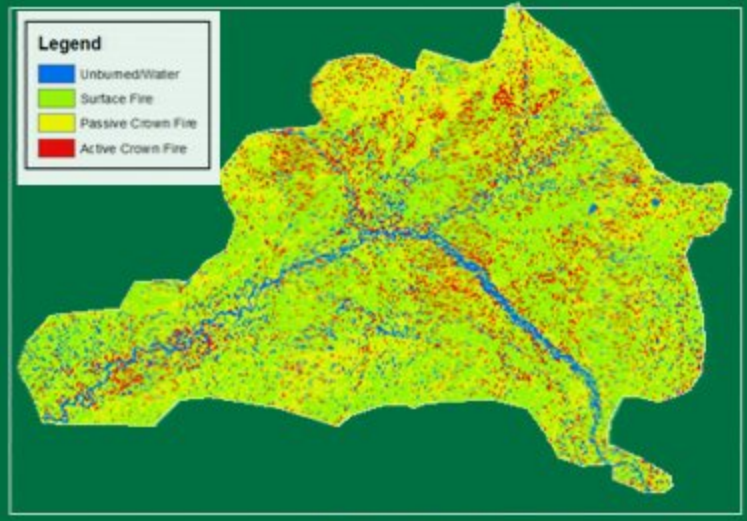
U.S. Department of the Interior
U.S. Geological Survey

Vegetation structure applications

- Fire behavior analyses
- Ecosystem health and successional stage
- Habitat mapping
- Climate and energy balance



LANDFIRE National EVH

- Height is mapped by lifeform with decision tree models
- Modeling data include:
  - Contributed plot data
  - Landsat imagery
  - DEM & derivatives
  - Ancillary data

CONUS & Hawaii EVH Legend

Herbaceous	Shrub	Tree
0 - 0.5 m	0 - 0.5 m	0 - 5 m
0.5 - 1.0 m	0.5 - 1.0 m	5-10 m
> 1 m	1.0 - 3.0 m	10 - 25 m
	> 3.0 m	25 - 50 m
		> 50 m

LANDFIRE National EVC

- LANDFIRE National 2001 forest canopy cover values obtained from NLCD
- Shrub and herb cover estimated from field data representing average values at 30 m
- Regression tree modeling
- Binned into 10% class

End user observations

- Forest height values tended to be too low
- Forest canopy cover values tended to be too high
- Significant impact on fire behavior modeling systems

LANDFIRE Refresh

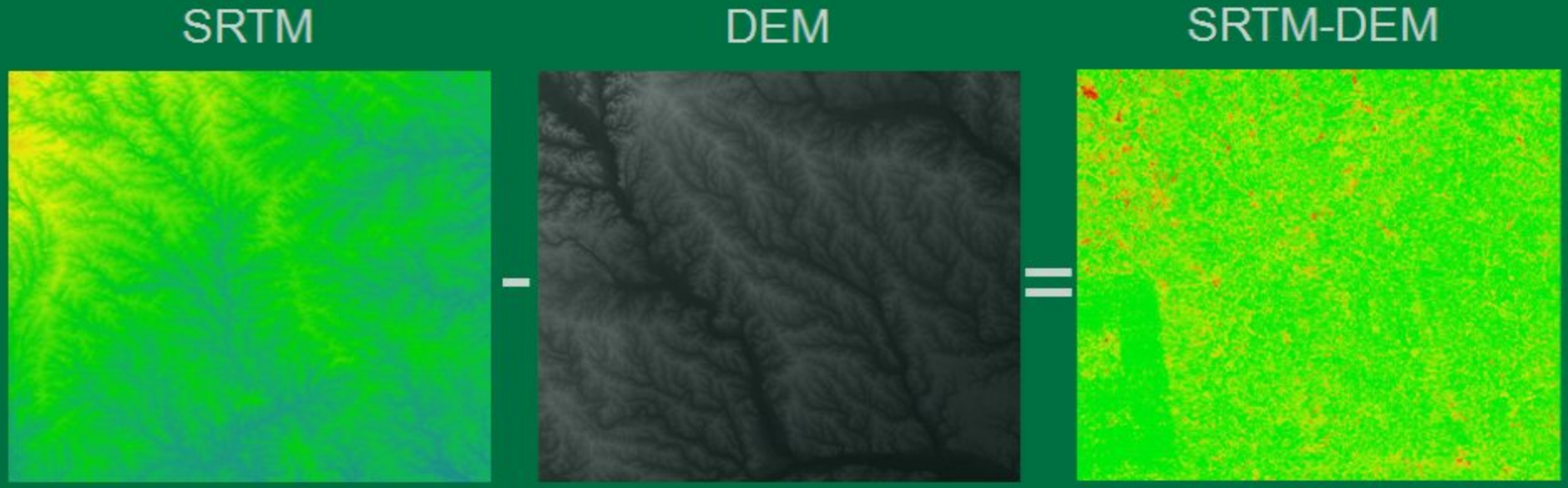
- Regression tree models using FIA-derived values of forest height and canopy cover, Landsat imagery, and terrain data
- Incorporated SRTM BAW height metric (Kellndorfer *et al*. 2004 RSE)

FIA data for canopy cover

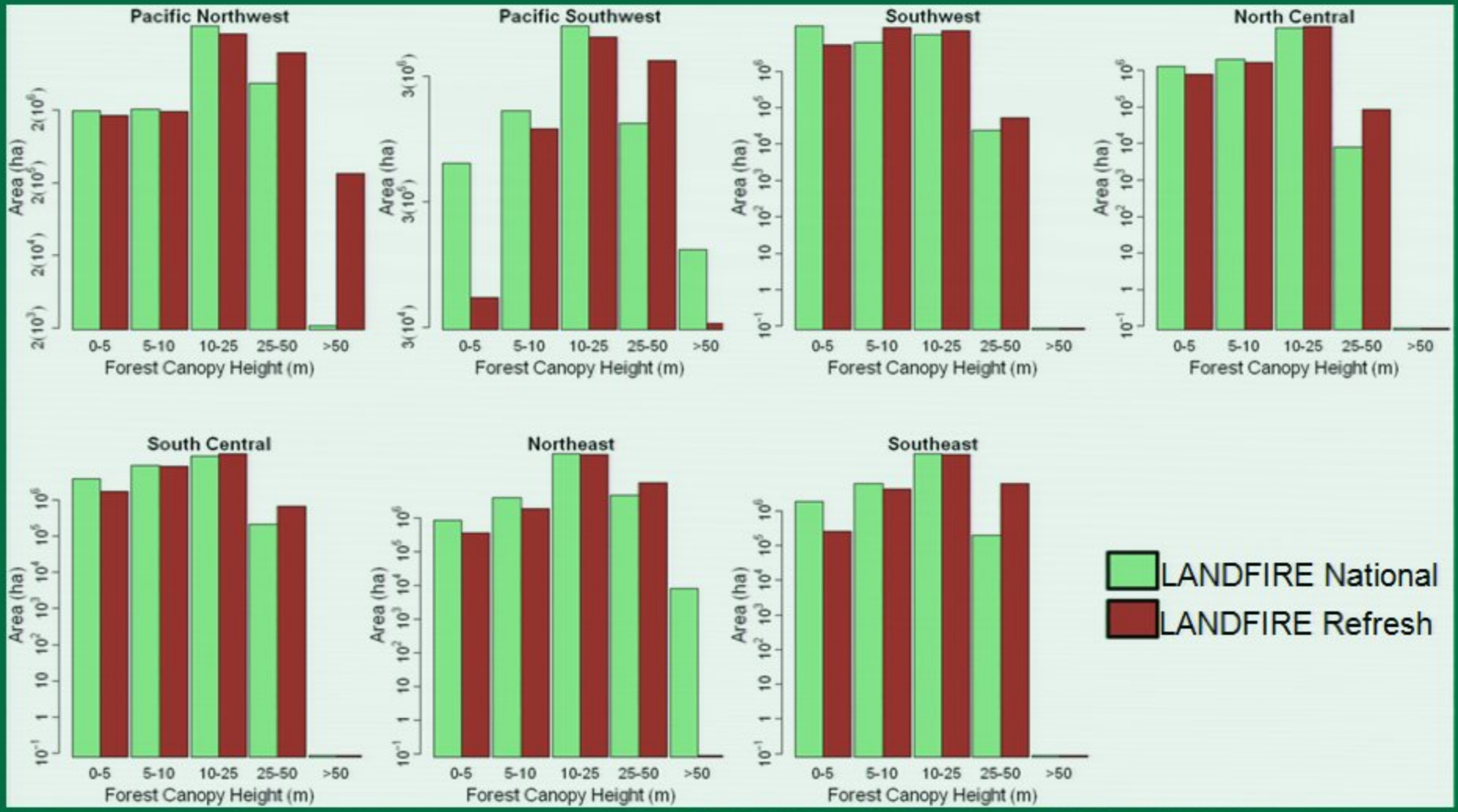
- Stem map-derived values of canopy cover (Toney et al. 2009)
  - IW-FIA used line intercept method to measure canopy cover for trees ≥ 1" diameter
  - Apply regression equations to predict crown width from stem diameter (≥ 5" diameter)
  - Geometric model to estimate canopy cover from predicted tree crowns

SRTM height product

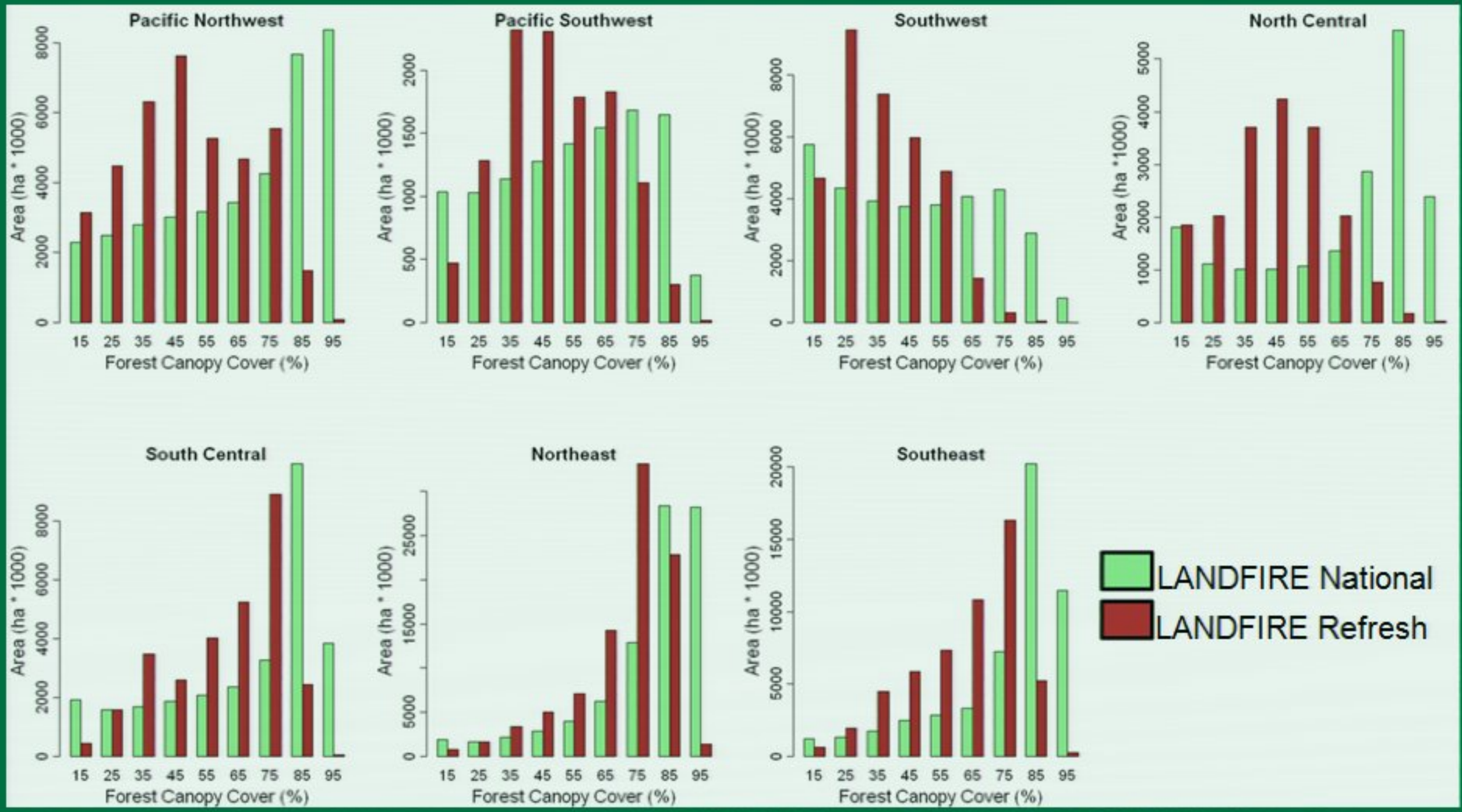
- SRTM provides a vertical structure measurement



Impacts: forest height



Impacts: forest cover



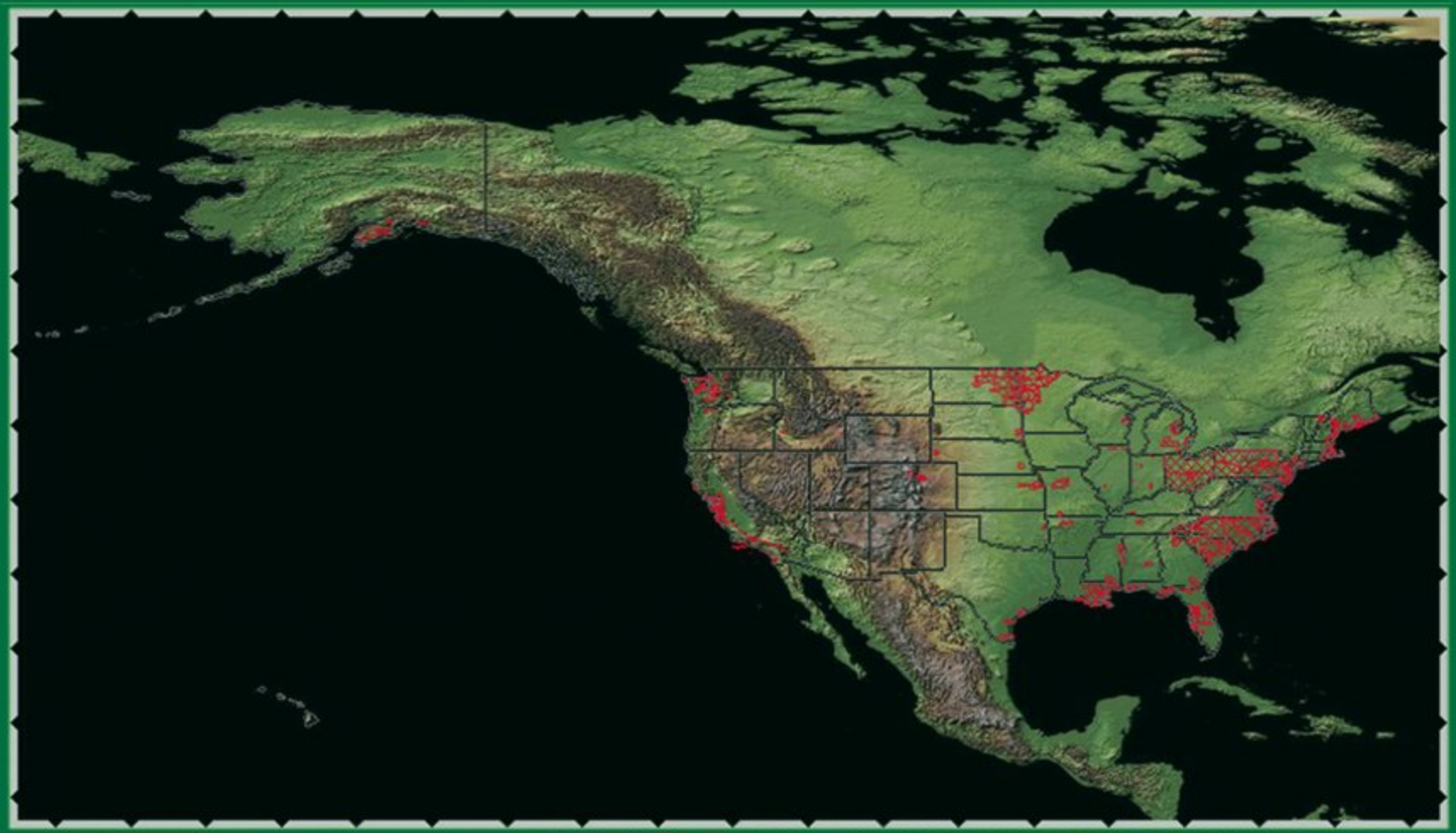
Updating to 2008

- Annual disturbance layers: Landsat-derived and contributed
- Existing structure updated based on pre-determined vegetation transitions
  - For forests, used FVS and FIA data to model 10 years of growth for vegetation/disturbance combinations
- FVS also implemented without incorporating disturbances to determine vegetation transitions in undisturbed areas

Integration of lidar data

- Lidar data provide observations of canopy structure
- Studies using airborne data for deriving canopy structure and fuel parameters
  - Andersen *et al*. 2005, RSE
  - Peterson *et al*. Accepted, PE&RS
- Spatial limitations of airborne lidar data

Airborne lidar data availability



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Spaceborne lidar

- ICESat/GLAS
  - Launched January 2003, decommissioned August 2010
  - Waveform lidar
  - Footprints ~ 65 m diameter
  - Footprints spaced 172 m apart along track
  - Almost 2 billion measurements made globally

Data issues

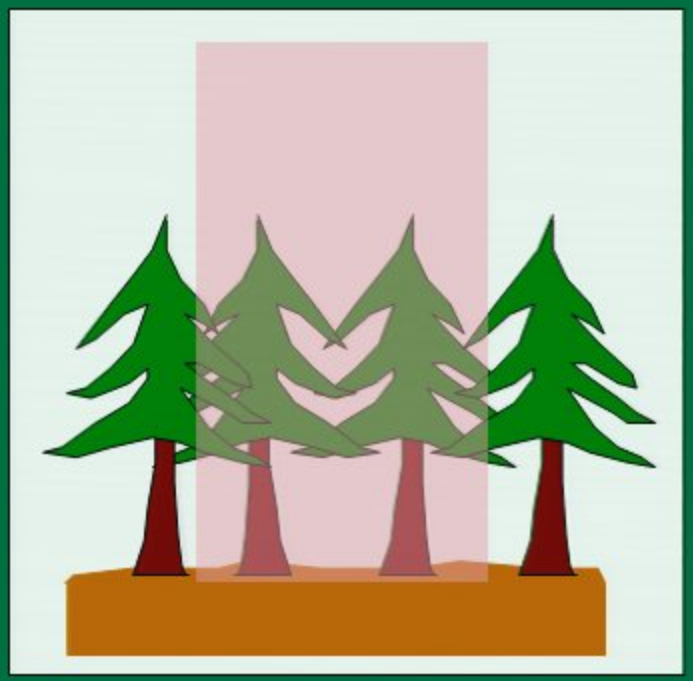
- Saturation of waveform
- Anomalies/outliers
- Heterogeneity of land cover within footprint
- Disturbance since date of collection
- Clouds
- Slope

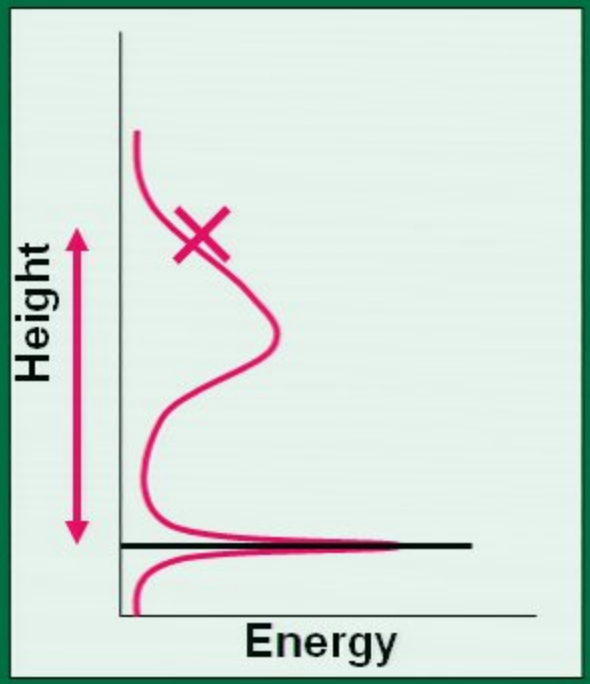
Slope

- Slope effects on waveform

Slope

- Slope effects on waveform





Slope

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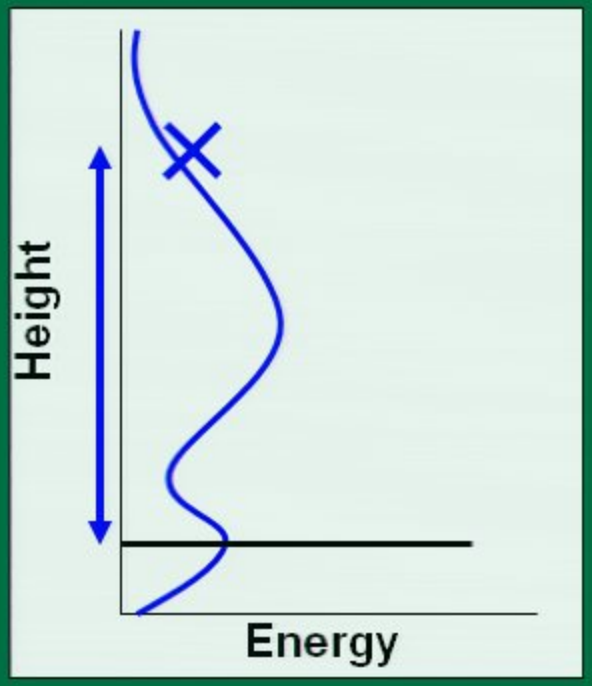

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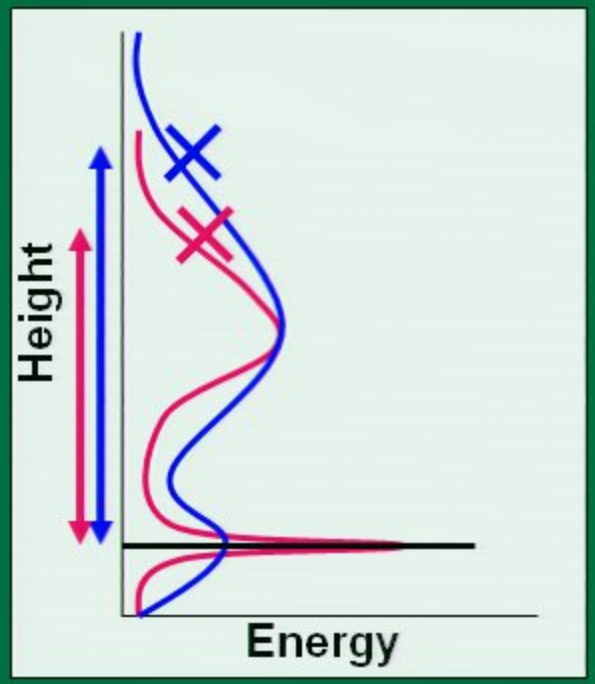
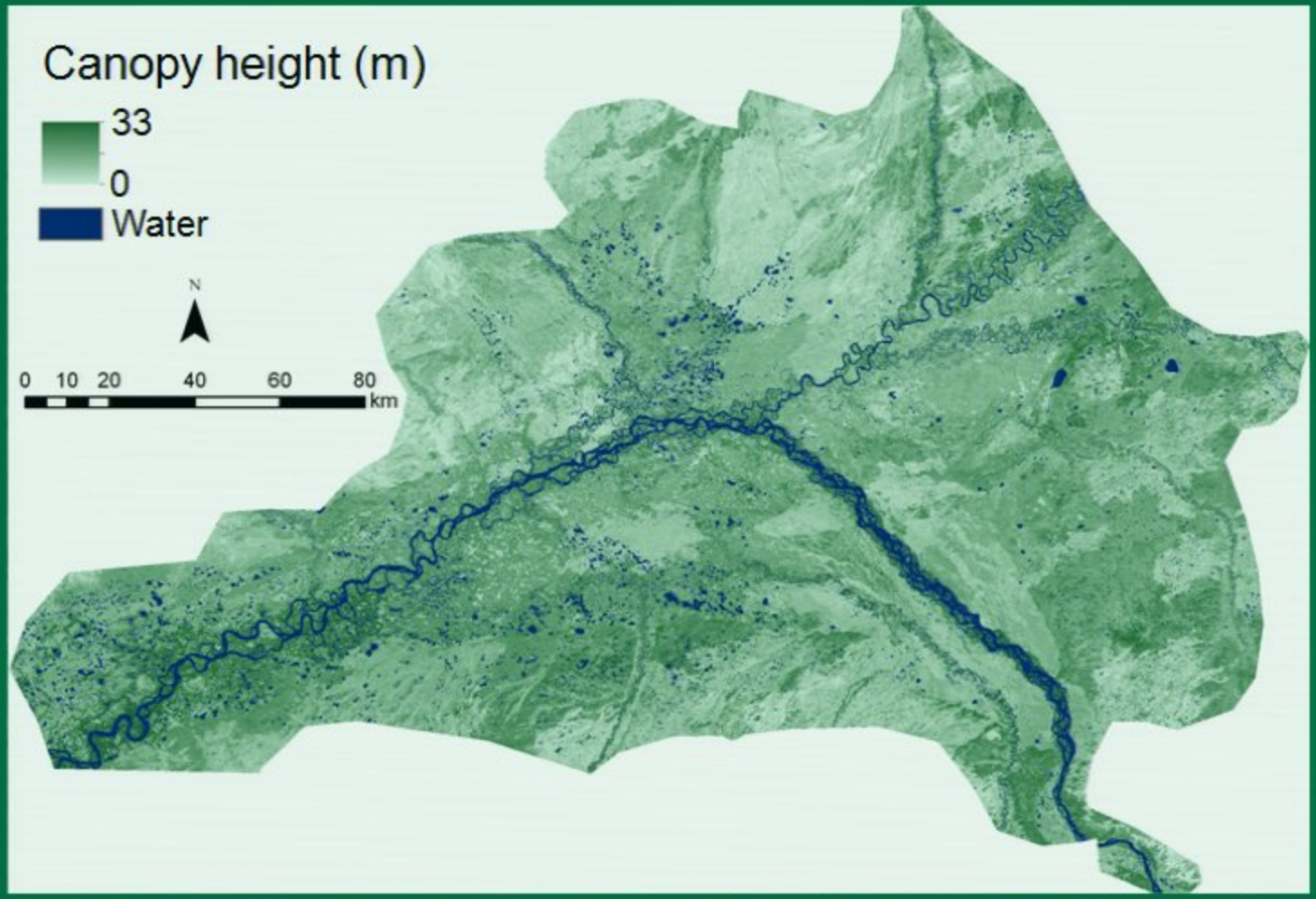


GLAS data availability in Alaska

- 1,247,447 GLAS footprints on forested lands
- Provide discrete samples of vegetation structure

GLAS-based canopy height



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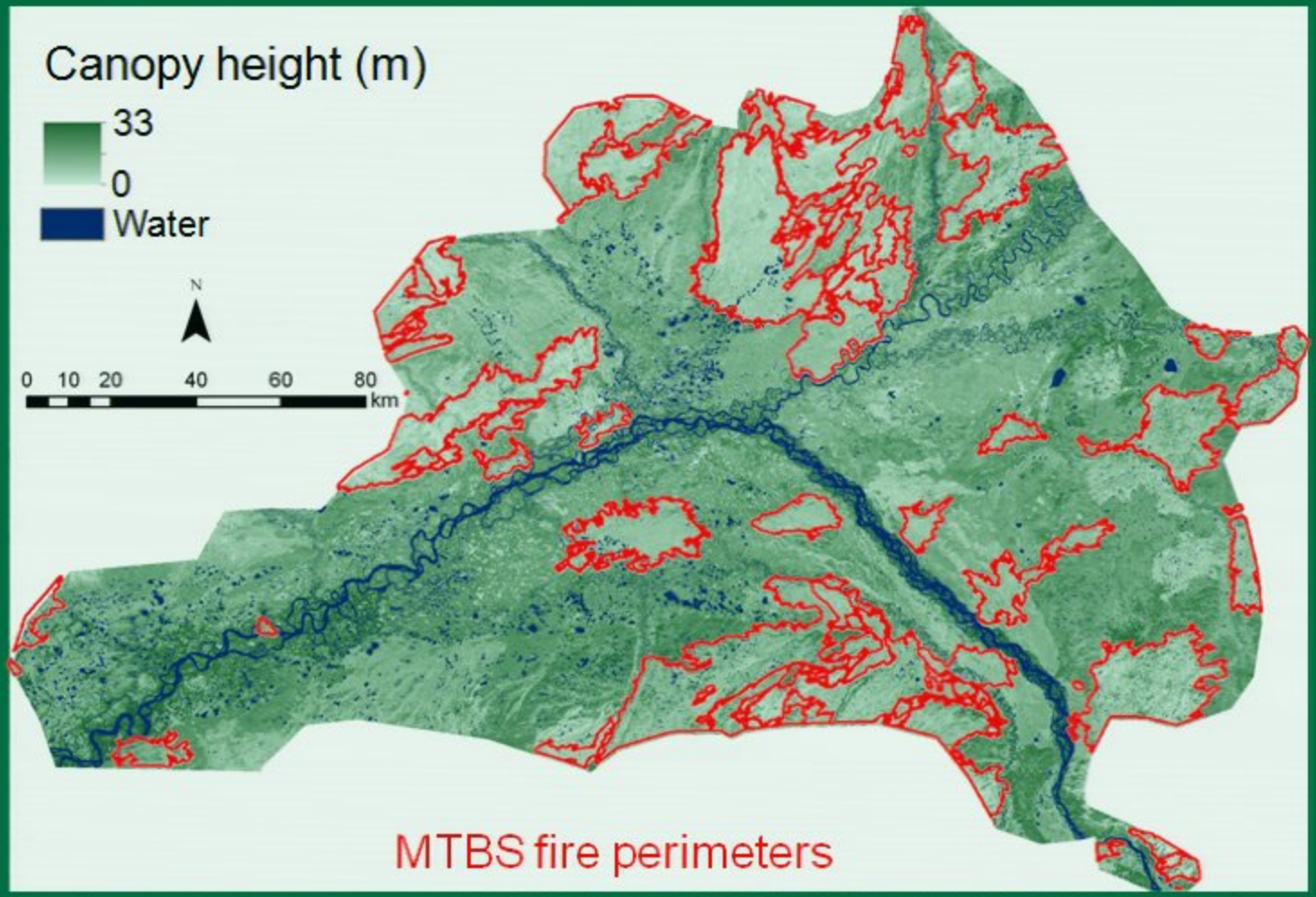
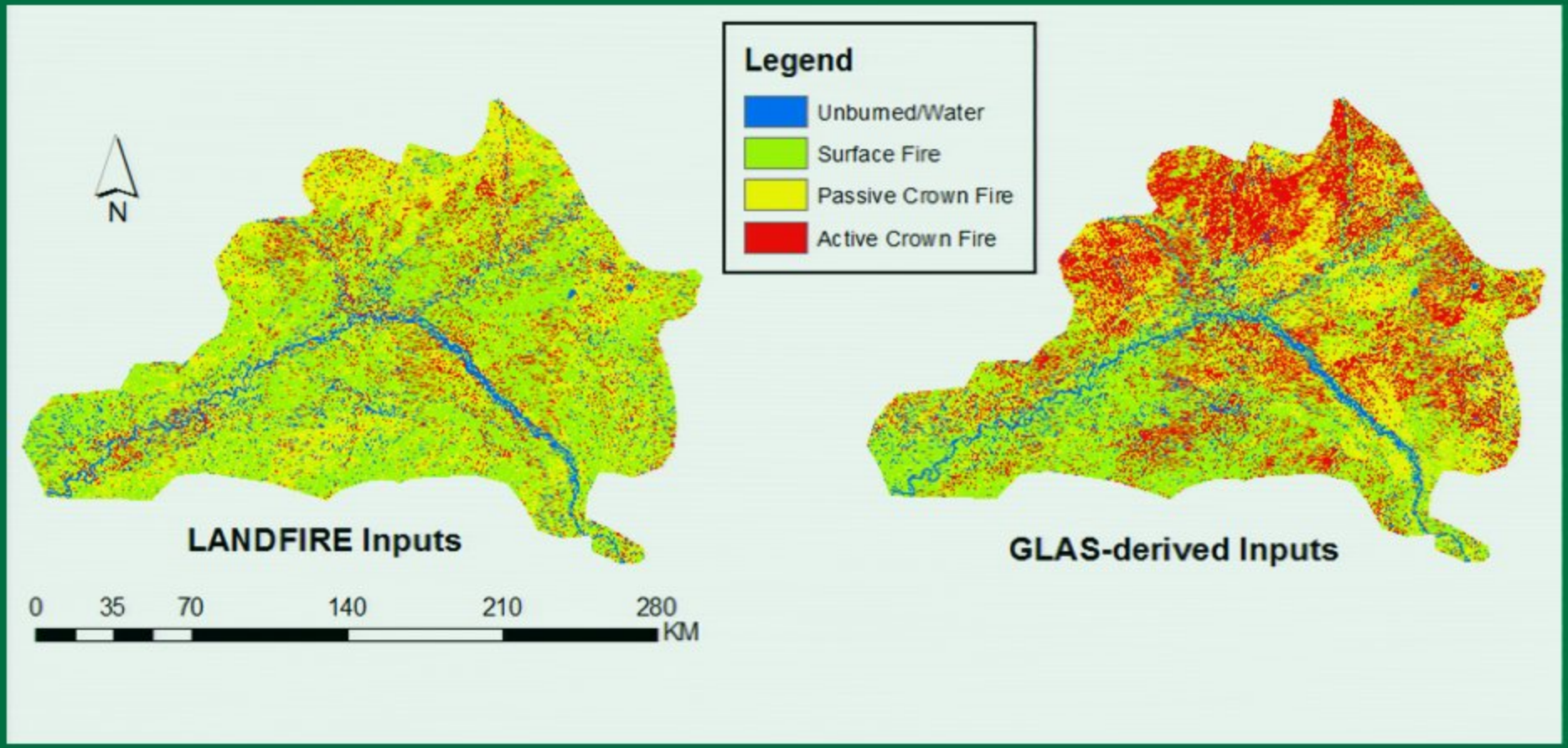
GLAS-based canopy height



FlamMap modeling outputs



Acknowledgements

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