Operational Use of MODIS

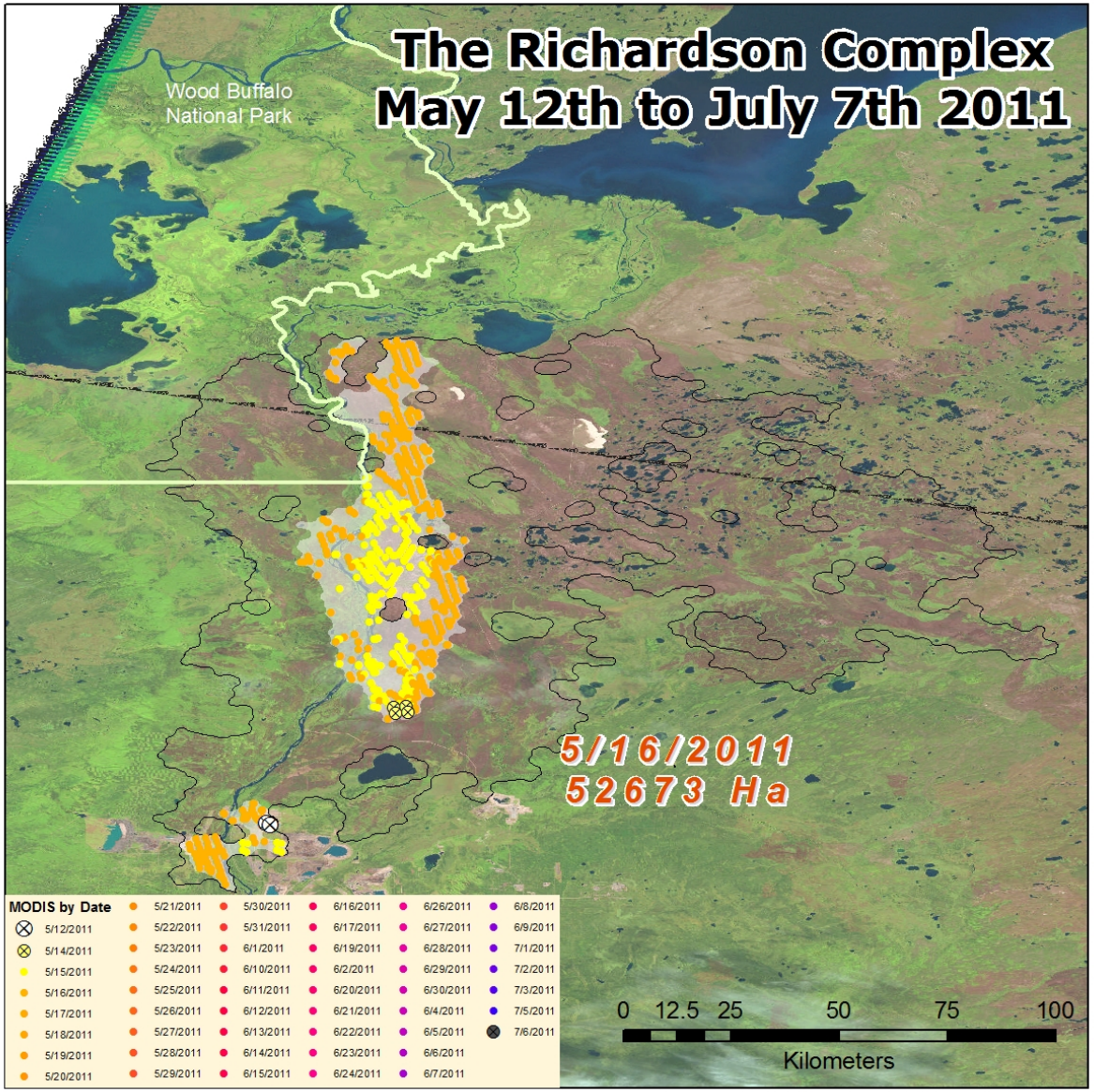
Vera Green

Geomatics Analyst, GNWT

Outline

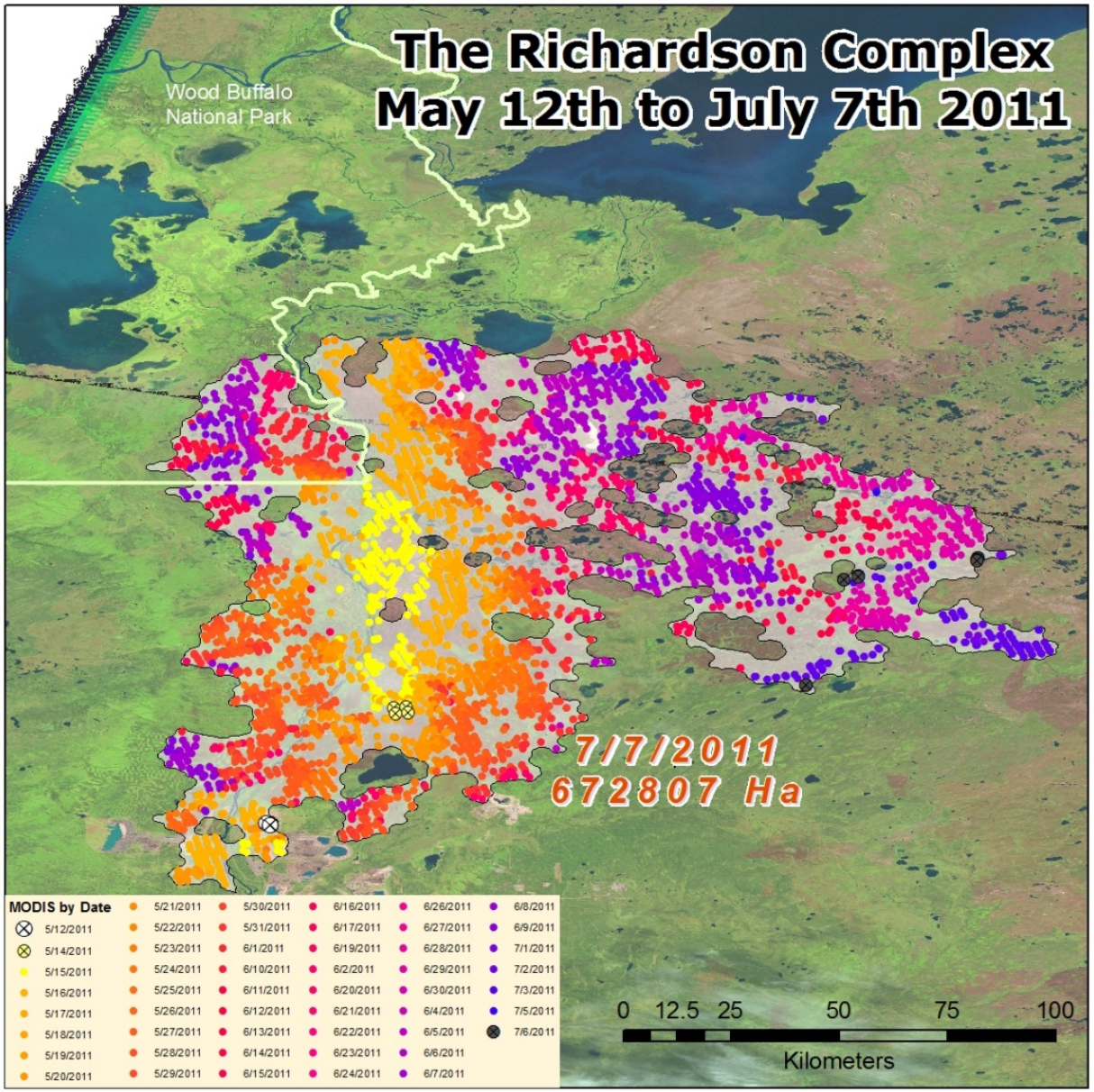
- Case study: Richardson Complex
- MODIS Workflow
- The Details
  - Cost
  - Speed
  - Accuracy
  - Accessibility

The Richardson Complex . . .



The Richardson Complex . . .

The Richardson Complex . . .

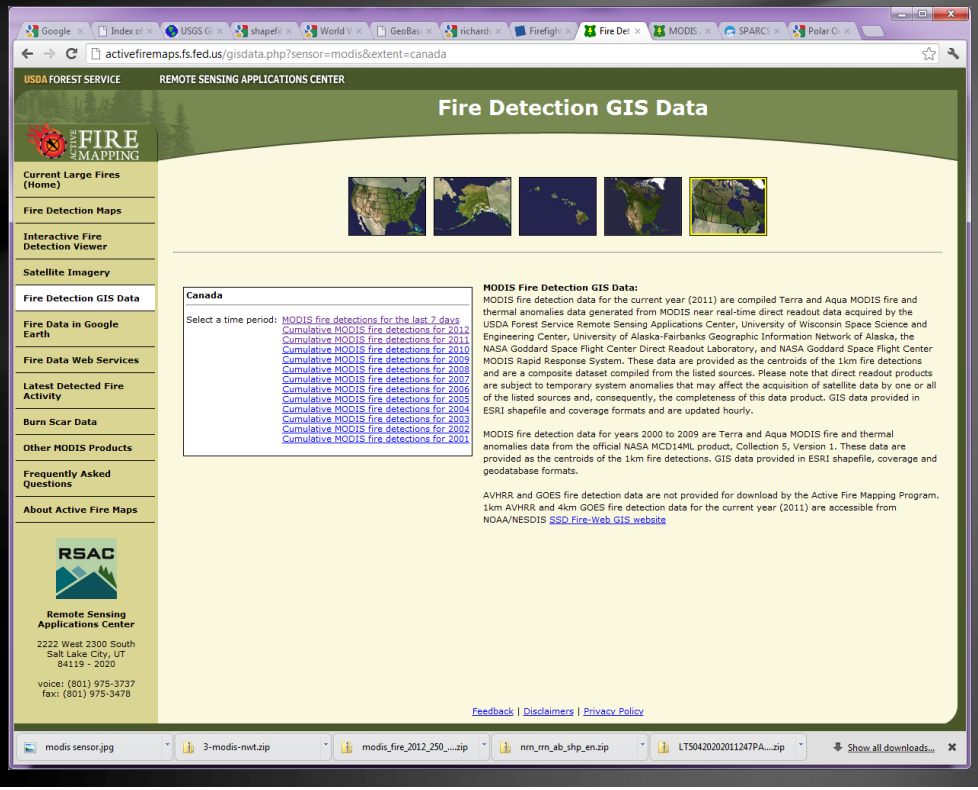


Source	Link	Date	Fire Day	Size from Media	MODIS Size	Accuracy
canada.com	http://www2.canada.com/story.html?id=4834312	24-May-11	12	175,286	174,900	100%
Fort McMurray Forum	http://fortmc.ca/fort-mcmurray-news/alberta-biggest-blaze-still-spreading-t2057.html	27-May-11	15	205,000	269,432	131%
The Canadian Press	http://www.globaltvedmonton.com/massive+northern+alberta+wildfire+nears+record+size/286988/story.html	6-Jun-11	24	386,796	426,119	110%
Fort McMurray Forum	http://fortmc.ca/fort-mcmurray-news/richardson-fire-now-biggest-blaze-alberta-years-t1996.html	8-Jun-11	26	415,000	489,426	118%
Fort McMurray Forum	http://fortmc.ca/fort-mcmurray-news/alberta-biggest-blaze-decades-holding-size-t1991.html	9-Jun-11	27	415,000	499,812	120%
Fort McMurry Today.com	http://www.fortmcmurraytoday.com/2011/06/10/firefighters-concentrate-on-richardson-fire	10-Jun-11	28	415,000	522,100	126%
Wildfire Danger Update	http://www.industrymailout.com/Industry/View.aspx?id=285219&q=325919111&qz=7939a6	13-Jun-11	31	571,260	558,035	98%
CBC News	http://www.cbc.ca/news/canada/edmonton/story/2011/06/15/edmonton-richardson-wildfire-pei.html	15-Jun-11	33	570,000	575,842	101%
Local Officians	http://en.wikipedia.org/wiki/File:RicardsonFireAlberta.png	27-Jun-11	45	613,360	609,372	99%
Agency GPS	**Parks Canada**	**28-Jun-11**	**46**	**639,889**	**611,669**	**96%**
Fort McMurry Today.com	http://www.fortmcmurraytoday.com/2011/08/16/richardson-backcountry-fire-under-control	16-Aug-11	55	700,000	632,131	90%
McMurray.com	http://www.mymcmurray.com/wildfire-season-ends-after-busy-2011/	31-Oct-11		707,648	632,131	89%

MODIS Workflow

1. MODIS Hot Spot data is collected and made publically available.

Web Download

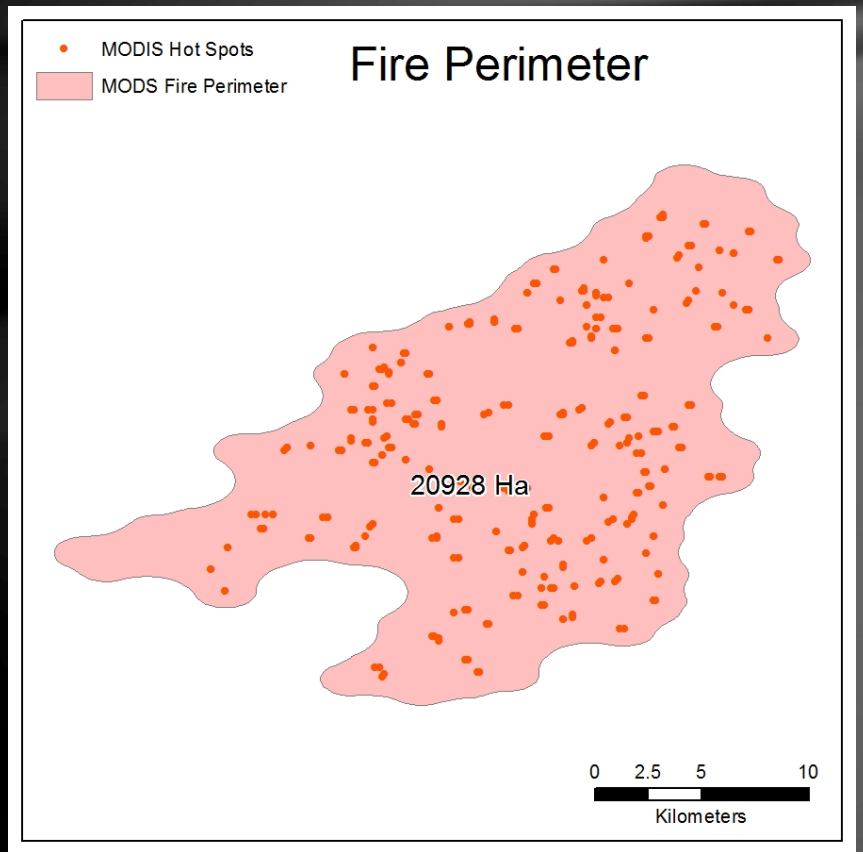


Database Transfer

MODIS Workflow

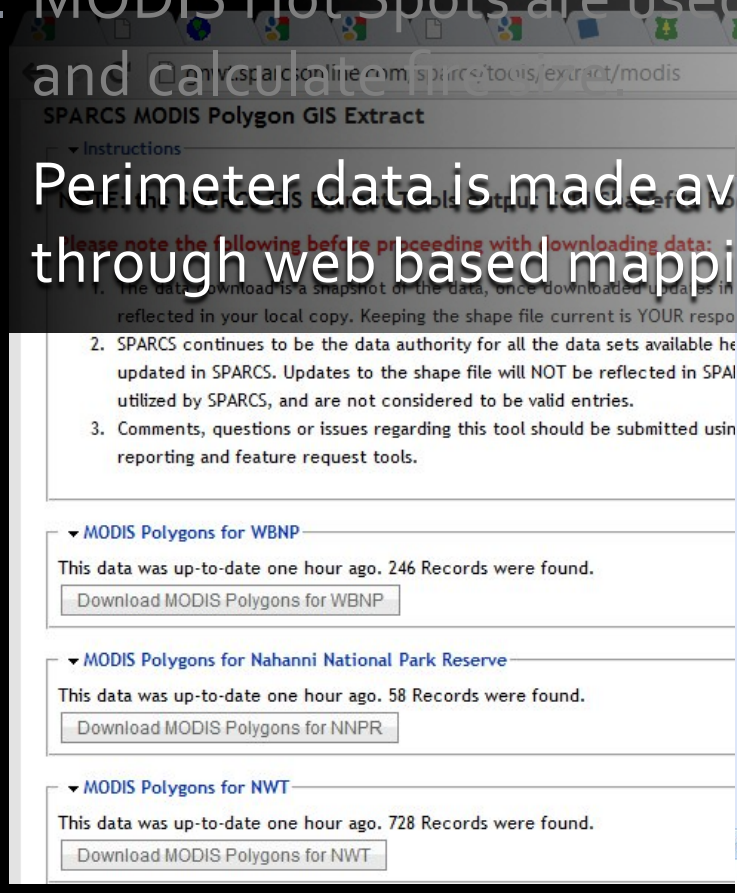
1. MODIS Hot Spot data is collected by the USGS and made publically available
2. MODIS Hot Spots are used to create a fire perimeter and calculate fire size.

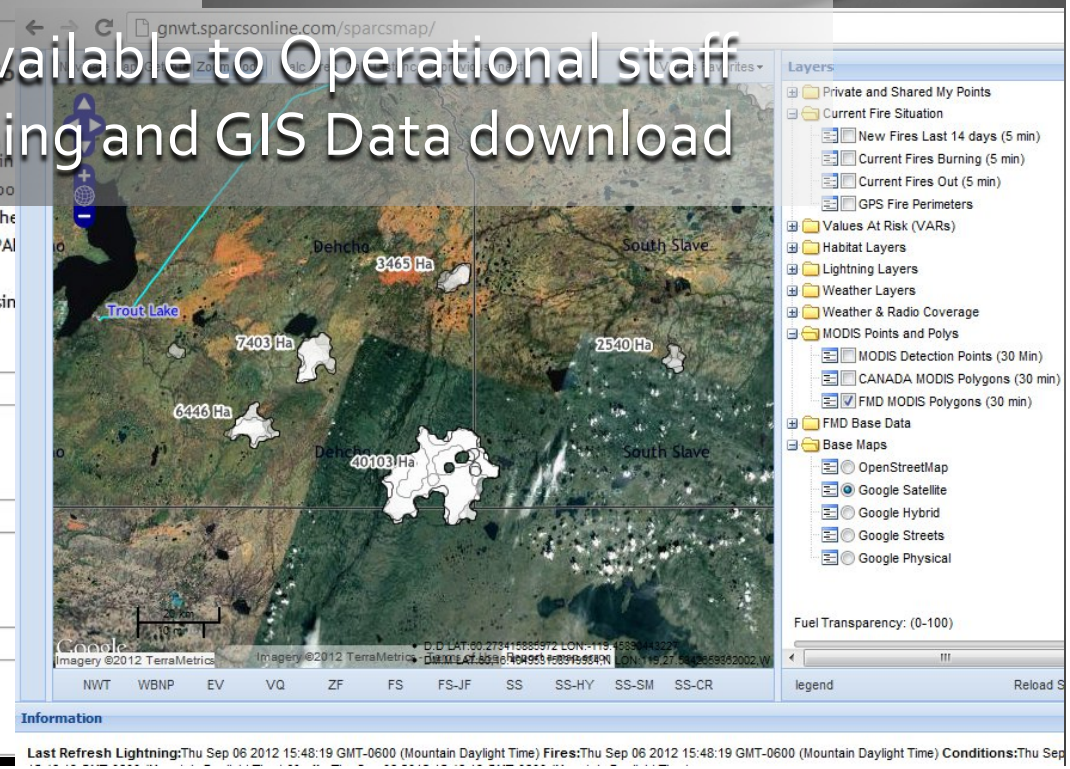
GIS Database
Automated Script



MODIS Workflow

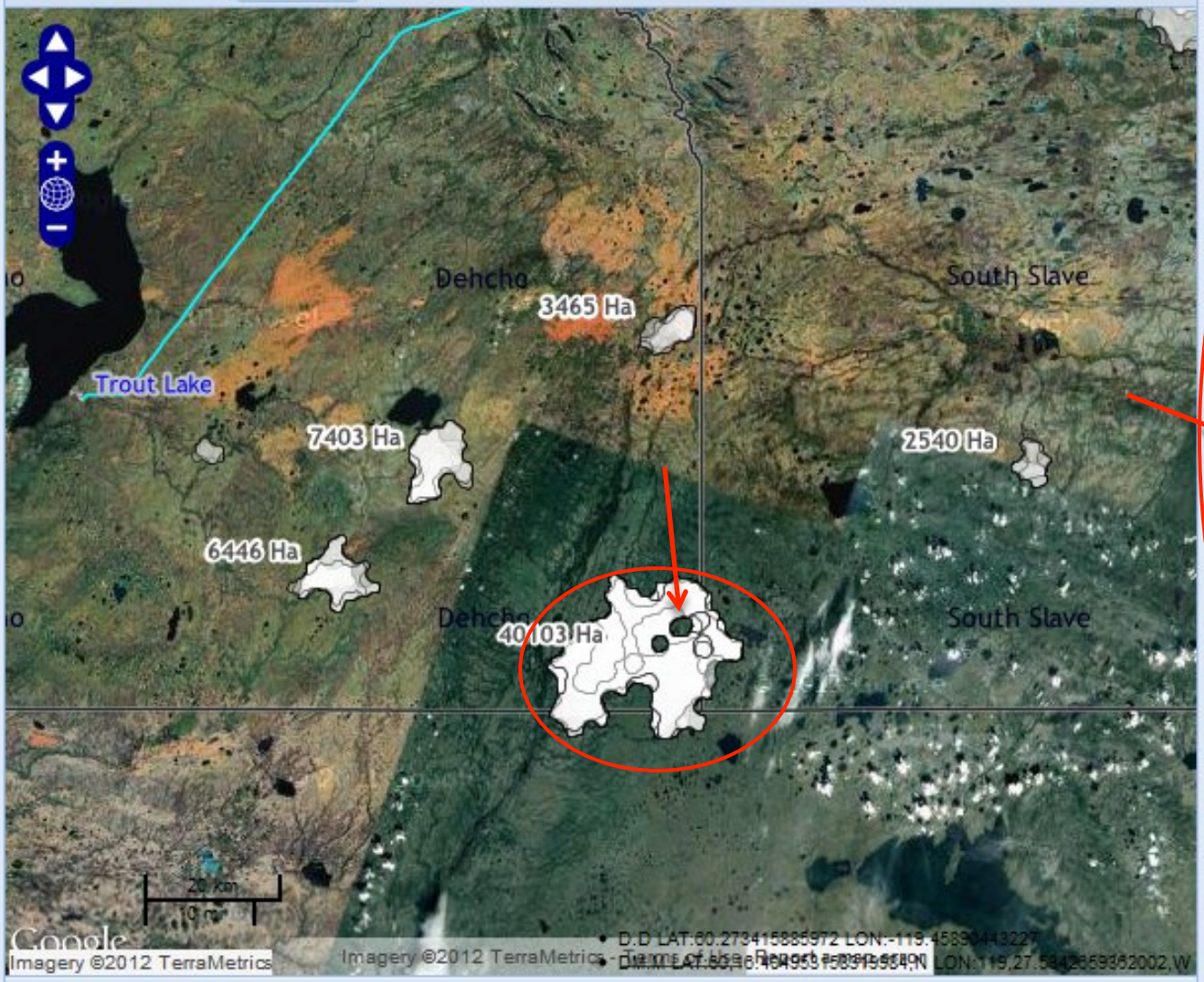
1. MODIS Hot Spot data is collected by the USGS and made publically available
2. MODIS Hot Spots are used to create a fire perimeter and calculate fire size
3. Perimeter data is made available to Operational staff through web based mapping and GIS Data download





gnwt.sparcsonline.com/sparcsmap/

Navigate Map | Get Info | Zoom Mode | Calc Area | Calc Distance | previous | next | Vera's Favorites



NWT | WBNP | EV | VQ | ZF | FS | FS-JF | SS | SS-HY | SS-SM | SS-CR

Layers

- Private and Shared My Points
- Current Fire Situation
  - New Fires Last 14 days (5 min)
  - Current Fires Burning (5 min)
  - Current Fires Out (5 min)
  - GPS Fire Perimeters
- Values At Risk (VARs)
- Habitat Layers
- Lightning Layers
- Weather Layers
- Weather & Radio Coverage
- MODIS Points and Polys
  - MODIS Detection Points (30 Min)
  - CANADA MODIS Polygons (30 min)
  - FMD MODIS Polygons (30 min)
- FMD Base Data
- Base Maps
  - OpenStreetMap
  - Google Satellite
  - Google Hybrid
  - Google Streets
  - Google Physical

Fuel Transparency: (0-100)

legend | Reload S

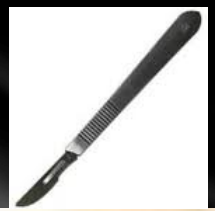
Information

Last Refresh Lightning: Thu Sep 06 2012 15:48:19 GMT-0600 (Mountain Daylight Time) **Fires:**Thu Sep 06 2012 15:48:19 GMT-0600 (Mountain Daylight Time) **Conditions:**Thu Sep

"Does it work?"

Every operations person / everywhere

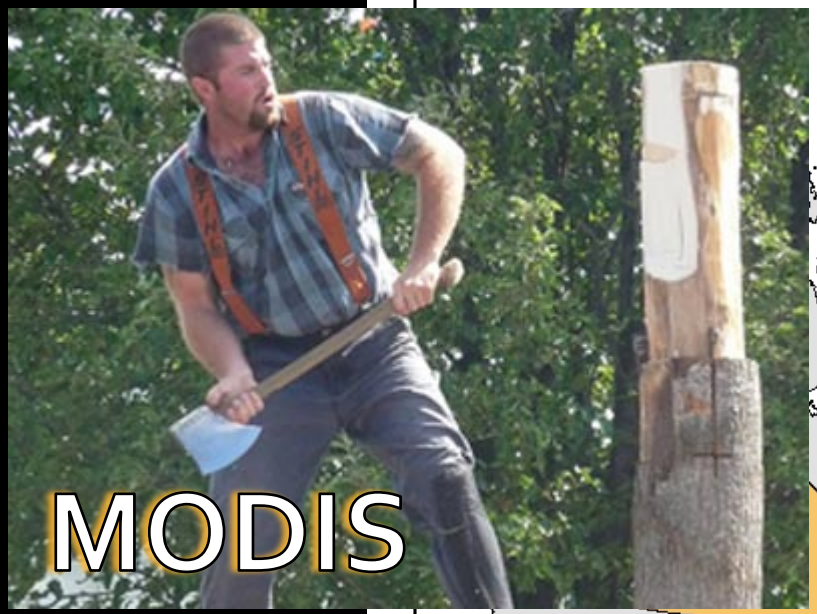
Axe vs. Scalpel

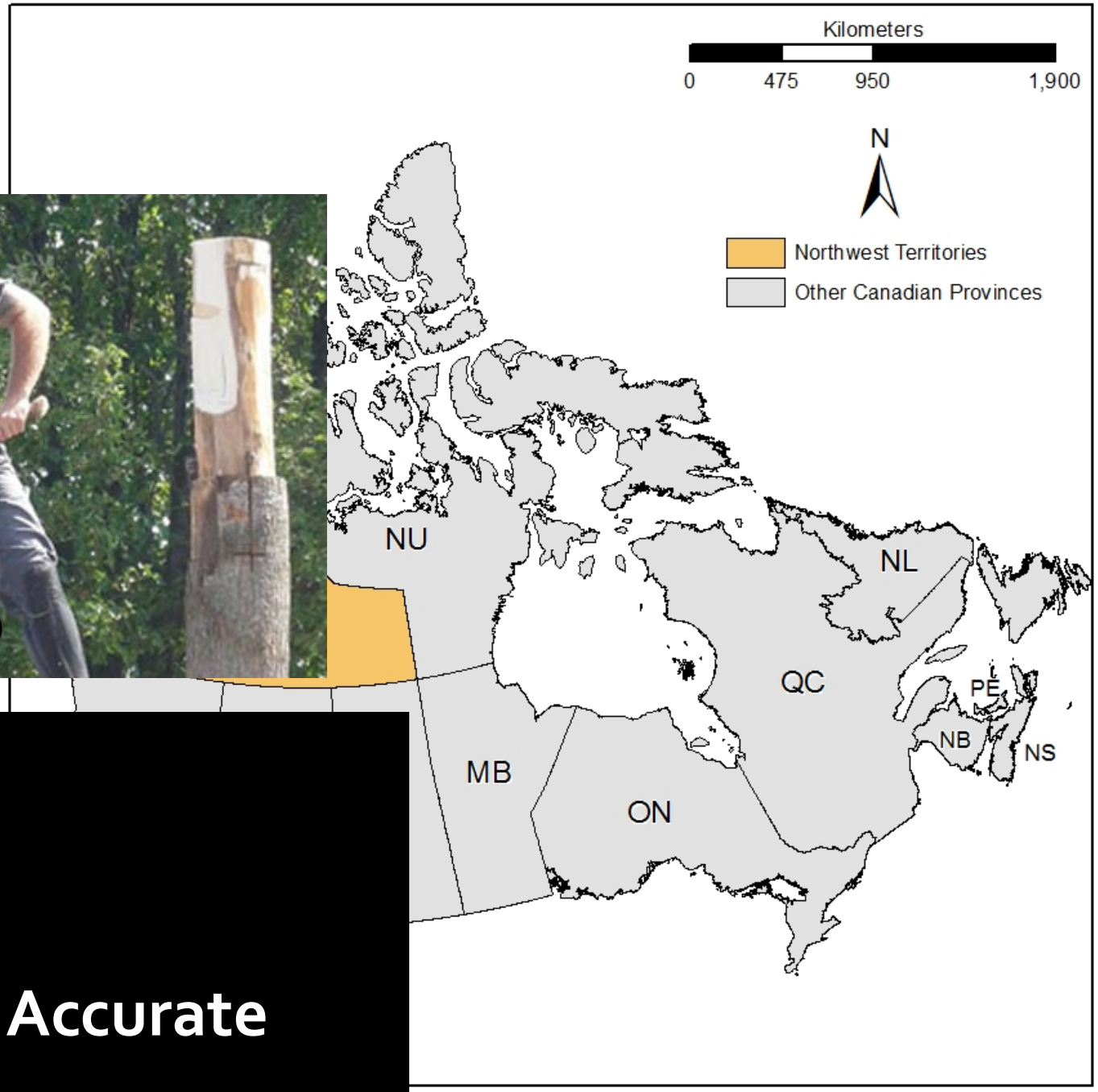


- Fast
- Easy
- Cheap
- Less Accurate

- Slow
- Difficult
- Expensive
- More Accurate

NWT . . .





- Fast
- Easy
- Cheep
- Not so Accurate

Fast

- **Near Real Time**
  - Available within a few hours of the satellite pass.
  - Collected 4+ times a day

Easy/Accessible

- Automated collection and processing
- Consistent
- Resource Independent

Cheap

- NWT spent 50$ on MODIS in 2012.
- One fixed wing fire flight costs ~ $3,000
- One Rotary Wing fire flight costs . . . a lot more.

Accurate ?

Area estimation accuracy

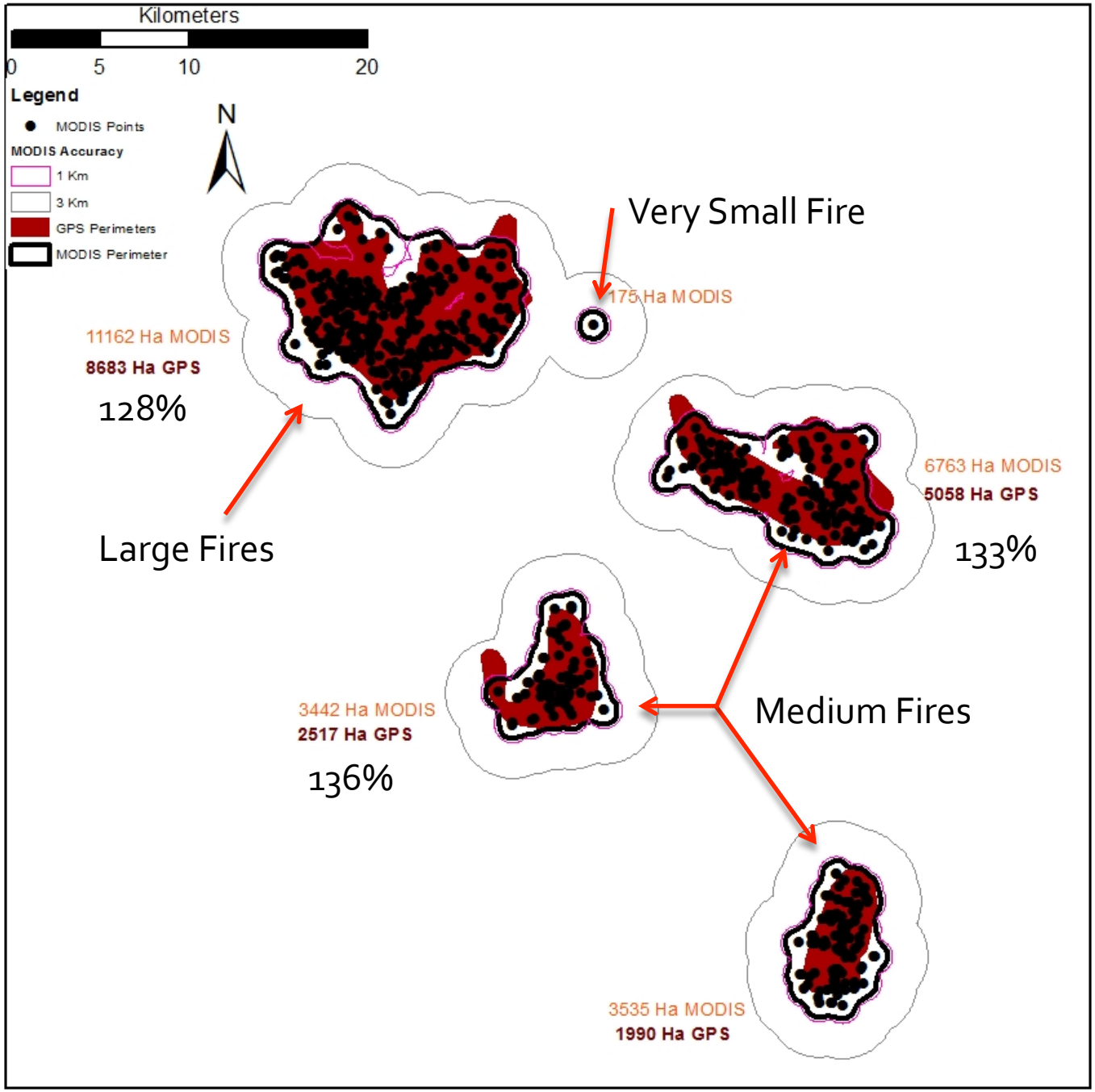
Fire **detection accuracy** is based on

- satellite pass timing
- collection angle
- fire intensity
- other environmental factors.

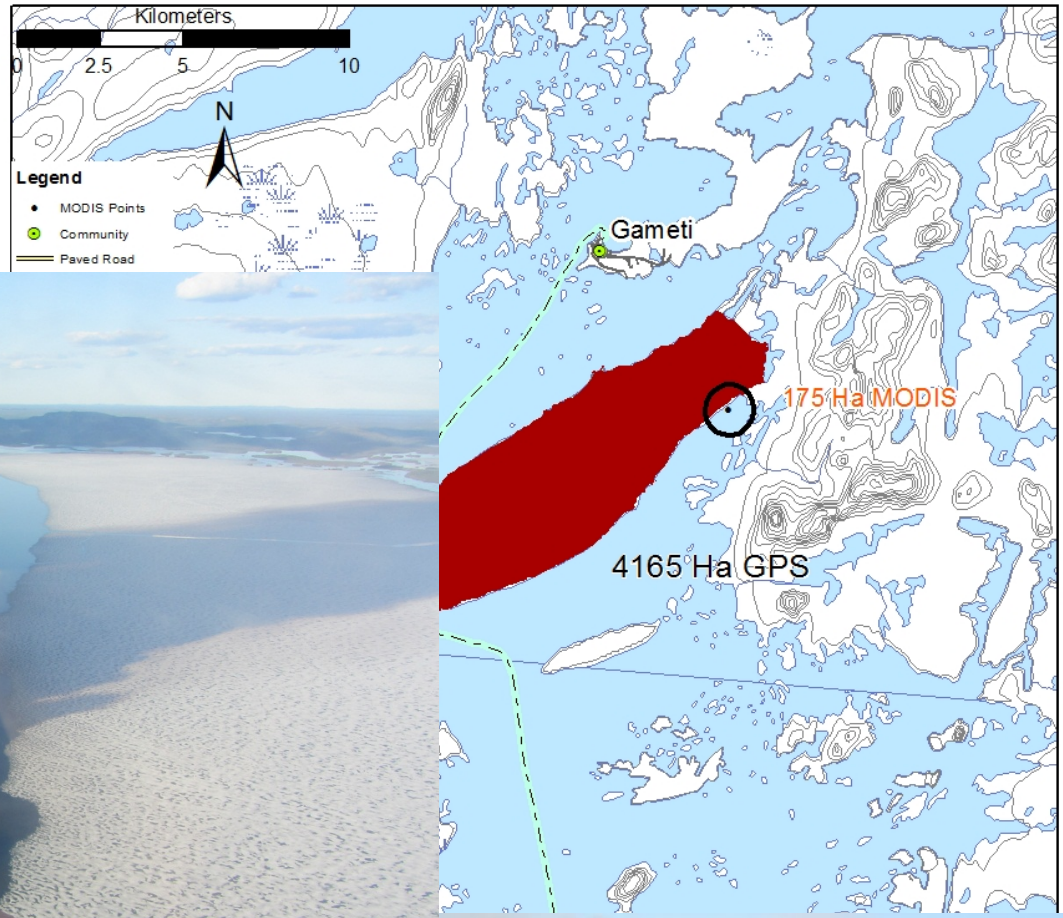
Resolution

MODIS Detection algorithm discussion paper:
http://cimss.ssec.wisc.edu/rss/references/MODIS_Fire_Algorithm.pdf

Vera Small Fires	< 300Ha	Not at all accurate
Small Fires	300 - 1000 Ha	Low Accuracy
Medium Fires	1000 = 10,000	Reasonably Accurate
Large	> 10,000	Statistically Comparable to fixed wing GPS

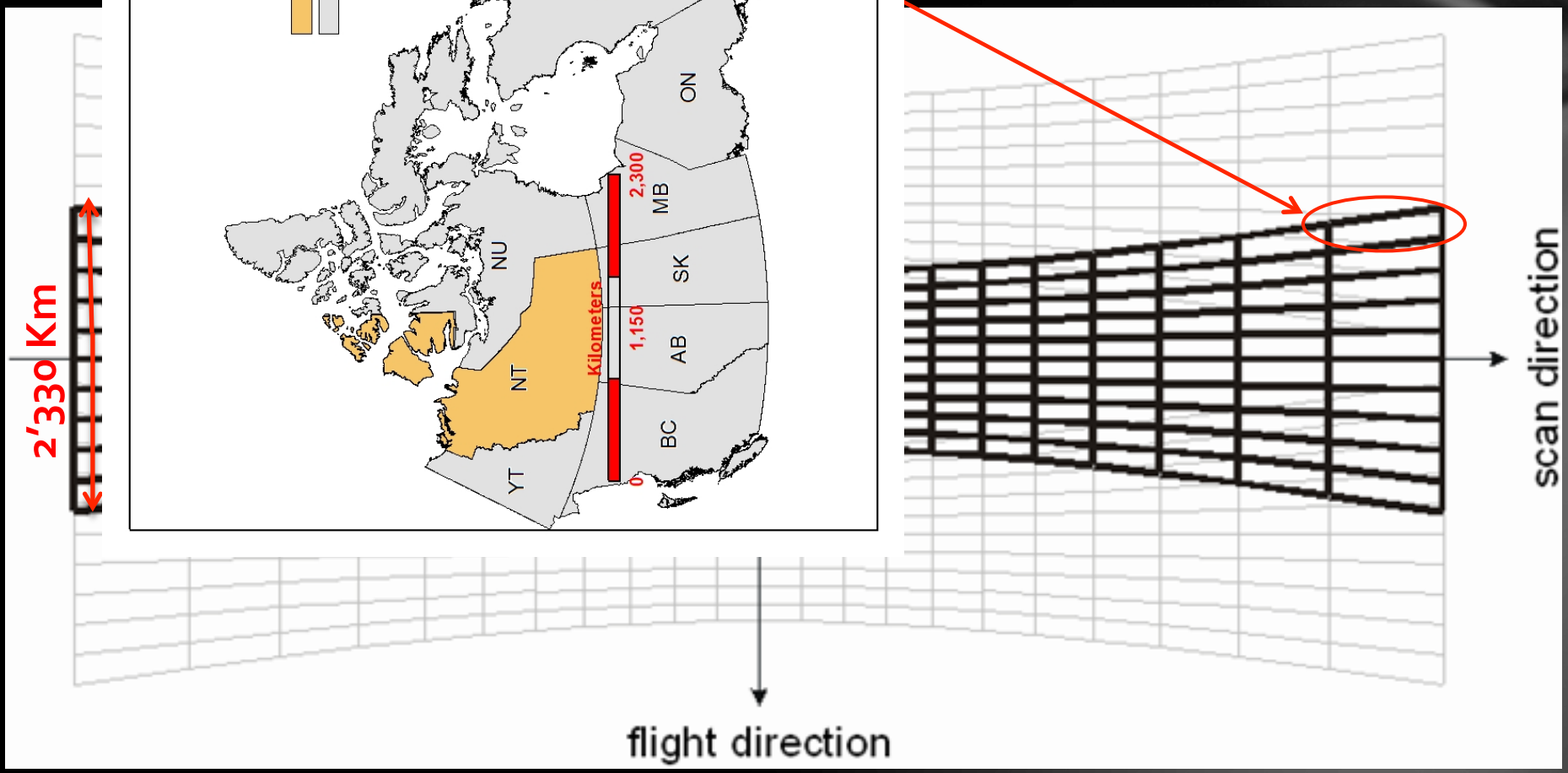

Kilometers
0
5
10
20
Legend
MODIS Points
MODIS Accuracy
1 Km
3 Km
GPS Perimeters
MODIS Perimeter
N
Very Small Fire
175 Ha MODIS
11162 Ha MODIS
8683 Ha GPS
128%
Large Fires
6763 Ha MODIS
5058 Ha GPS
133%
3442 Ha MODIS
2517 Ha GPS
136%
Medium Fires
3535 Ha MODIS
1990 Ha GPS

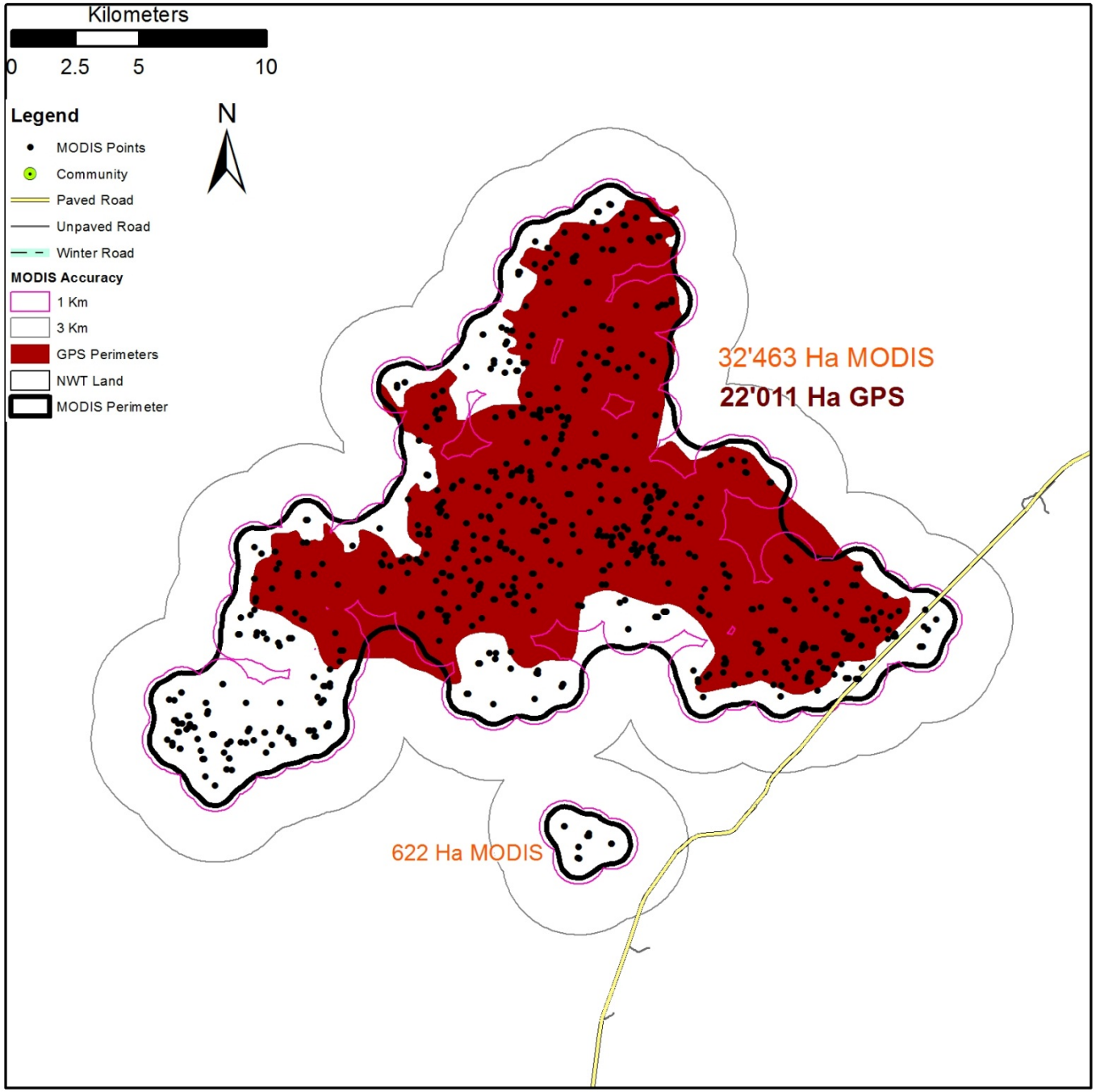
Accurate?

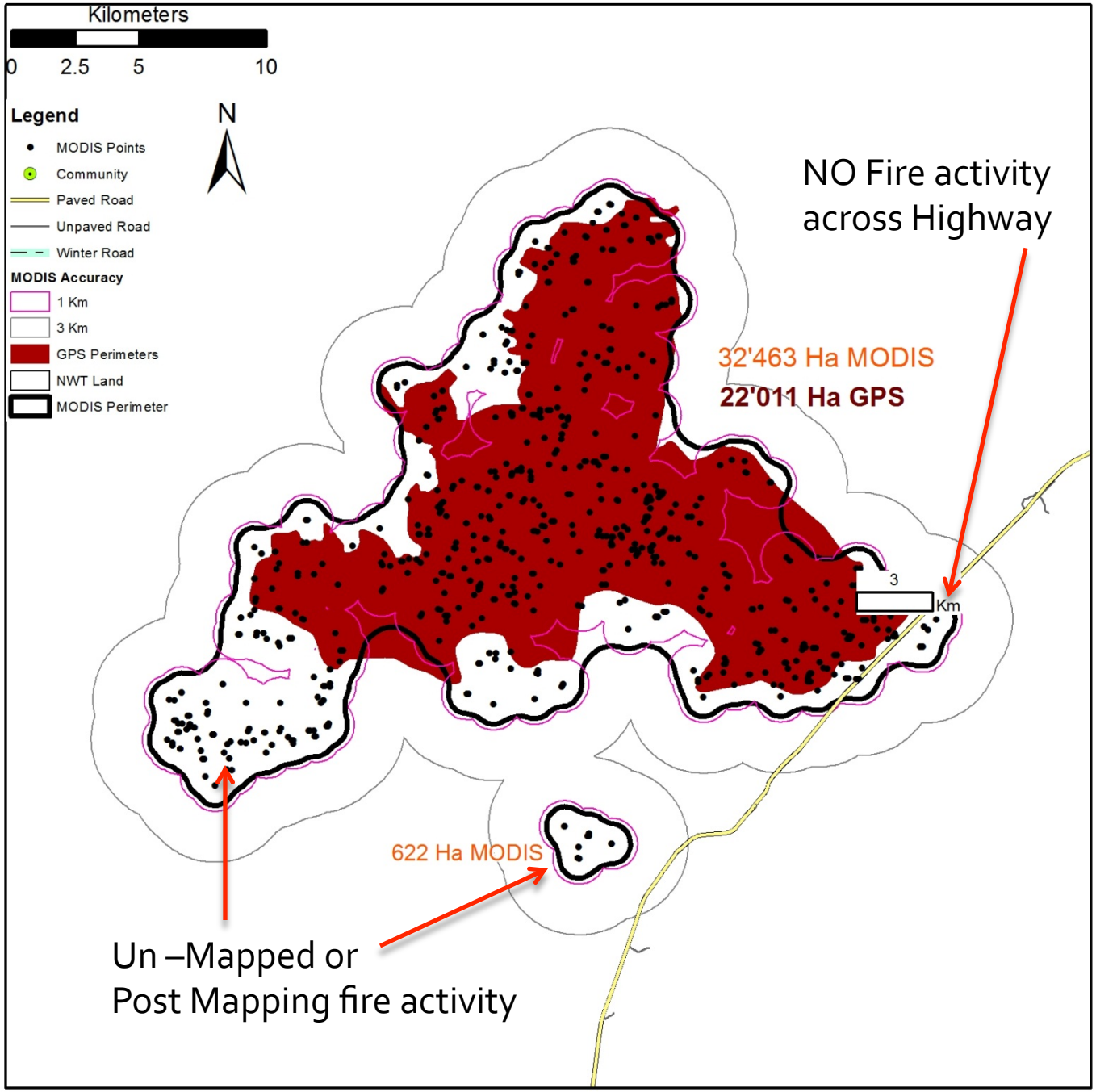

Kilometers
0
2.5
5
10
N
Legend
MODIS Points
Community
Paved Road
Gameti
175 Ha MODIS
4165 Ha GPS

A

n: 1 to 3 Km


2'330 Km
N
Northwest Territories
Other Canadian Provinces
YT
NT
NU
BC
AB
SK
MB
ON
QC
NL
PE
NB
NS
0
1,150
2,300
Kilometers
flight direction
scan direction


Kilometers
0
2.5
5
10
Legend
MODIS Points
Community
Paved Road
Unpaved Road
Winter Road
MODIS Accuracy
1 Km
3 Km
GPS Perimeters
NWT Land
MODIS Perimeter
N
32'463 Ha MODIS
22'011 Ha GPS
622 Ha MODIS


Kilometers
0
2.5
5
10
Legend
MODIS Points
Community
Paved Road
Unpaved Road
Winter Road
MODIS Accuracy
1 Km
3 Km
GPS Perimeters
NWT Land
MODIS Perimeter
N
NO Fire activity across Highway
32'463 Ha MODIS
22'011 Ha GPS
3
Km
622 Ha MODIS
Un –Mapped or
Post Mapping fire activity

Using MODIS for tactical and strategic decisions

- Detecting new Fire Starts
- Monitoring fire area
- Assessing fire activity on the landscape
- Planning on strength staffing and resource location.

Conclusion

- Increased awareness of fire activity on our land base
- Improved timeliness of area burnt statistics during the fire season
- Improved tactical planning and decision making

MODIS - One more tool for your tool box . . .

It's better to know than to not know