

Applications of GeoInformation technology in forest monitoring and management in Israel

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Applications

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graph TD; Applications[Applications] --> Mapping[Mapping]; Applications --> Inv_Monitoring[Inv. & Monitoring]; Applications --> Ecosystem[Ecosystem functioning];
```

Mapping

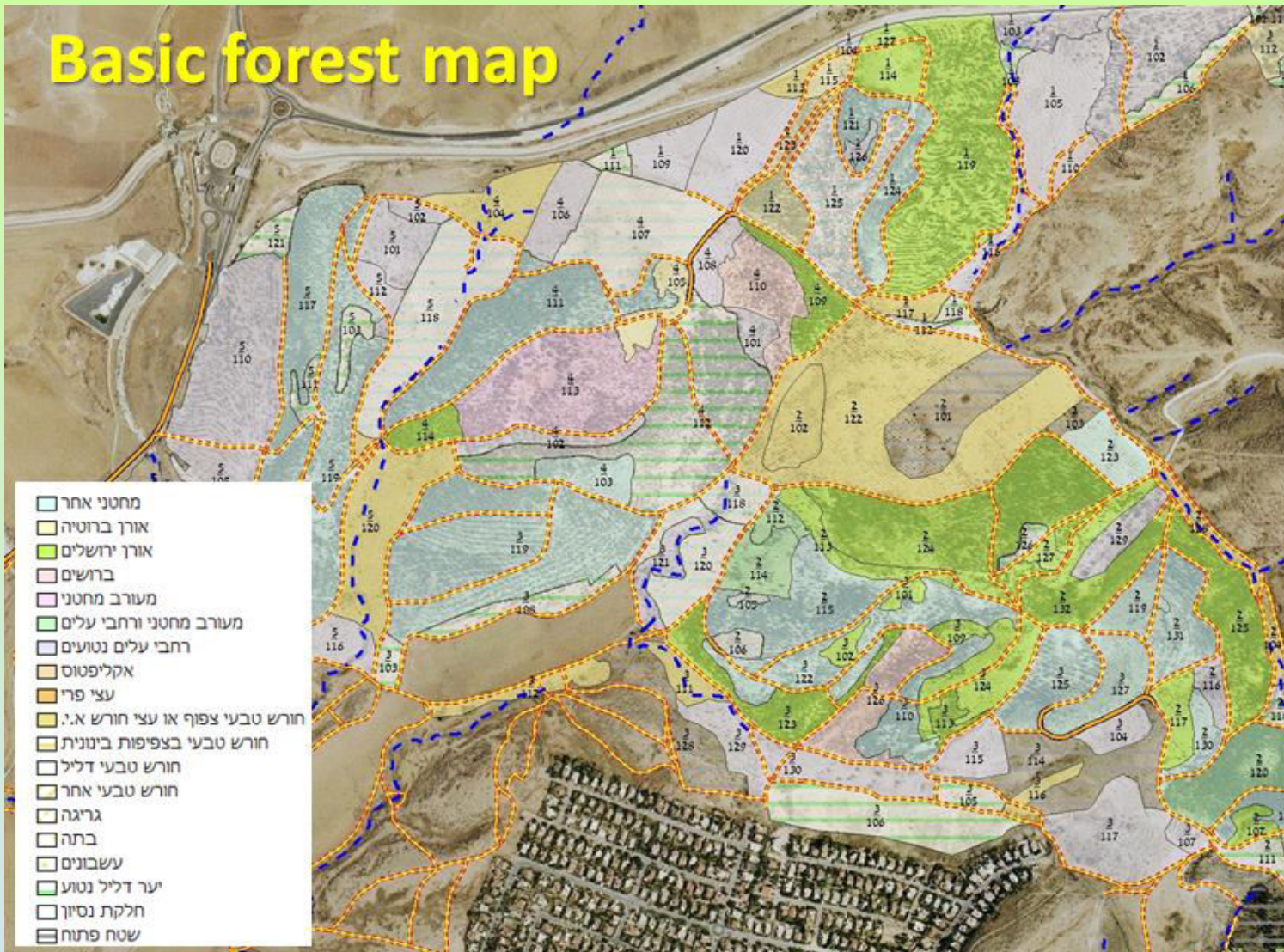
**Inv. &
Monitoring**

**Ecosystem
functioning**

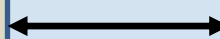
- **Collecting data**
- **Tracking changes**
- **Generating alerts**

Mapping

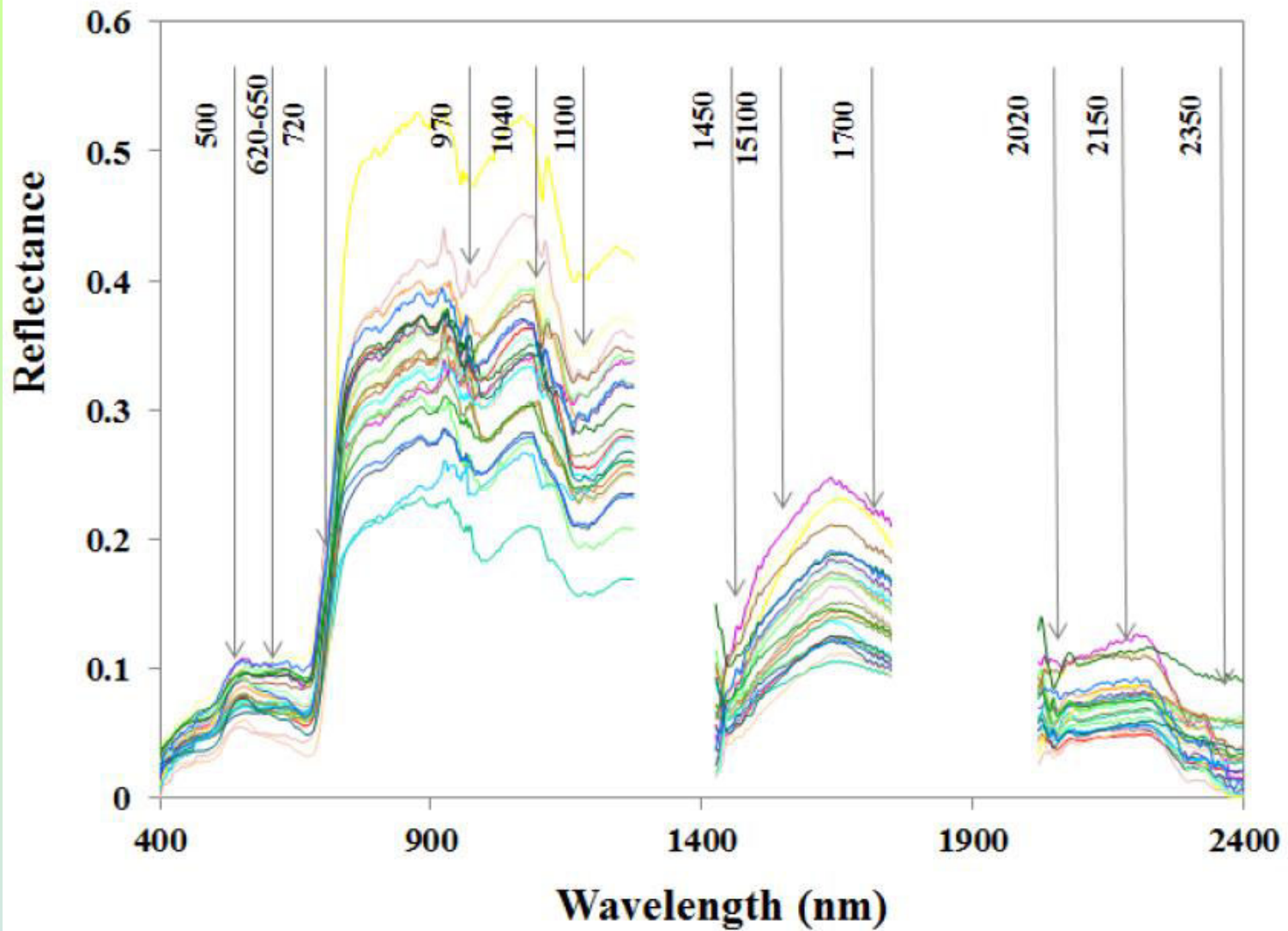
Basic forest map



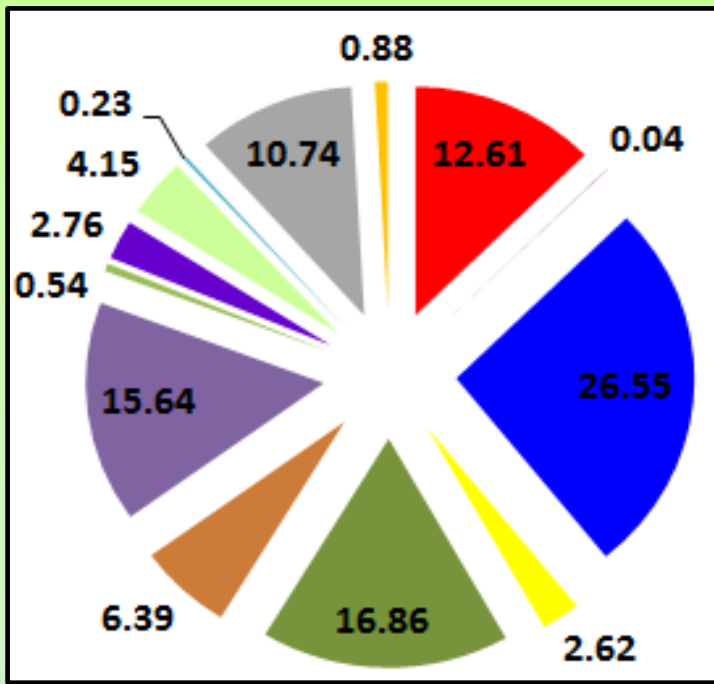
Remote



Gr. based

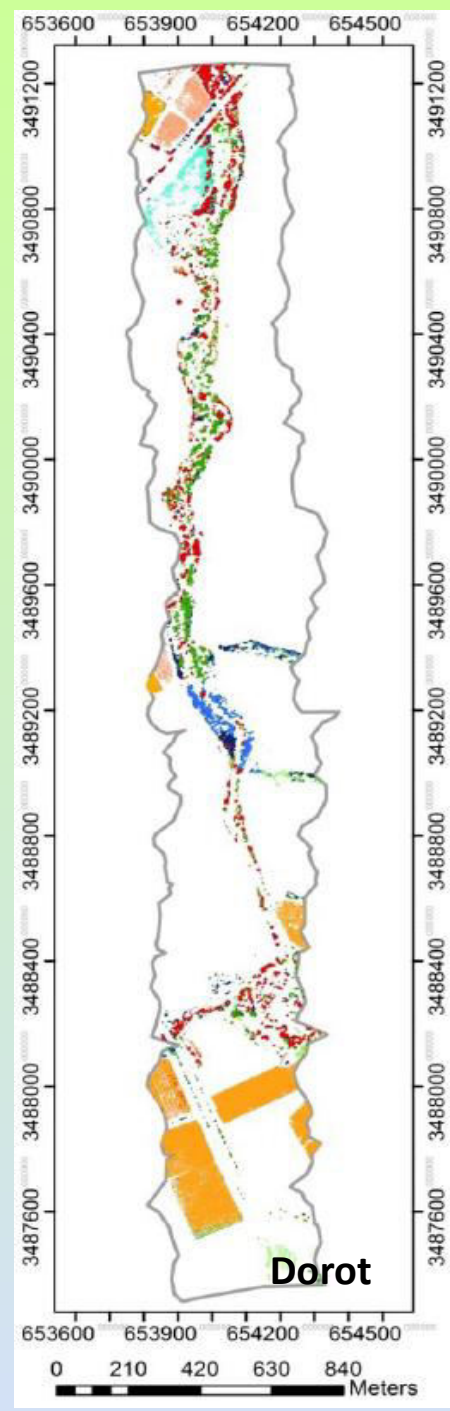
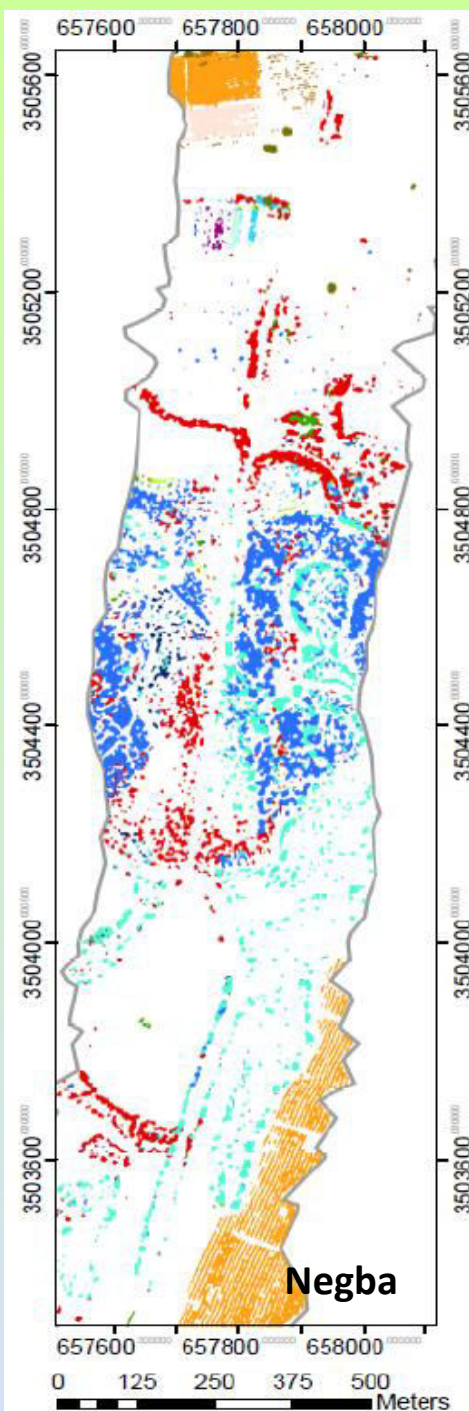


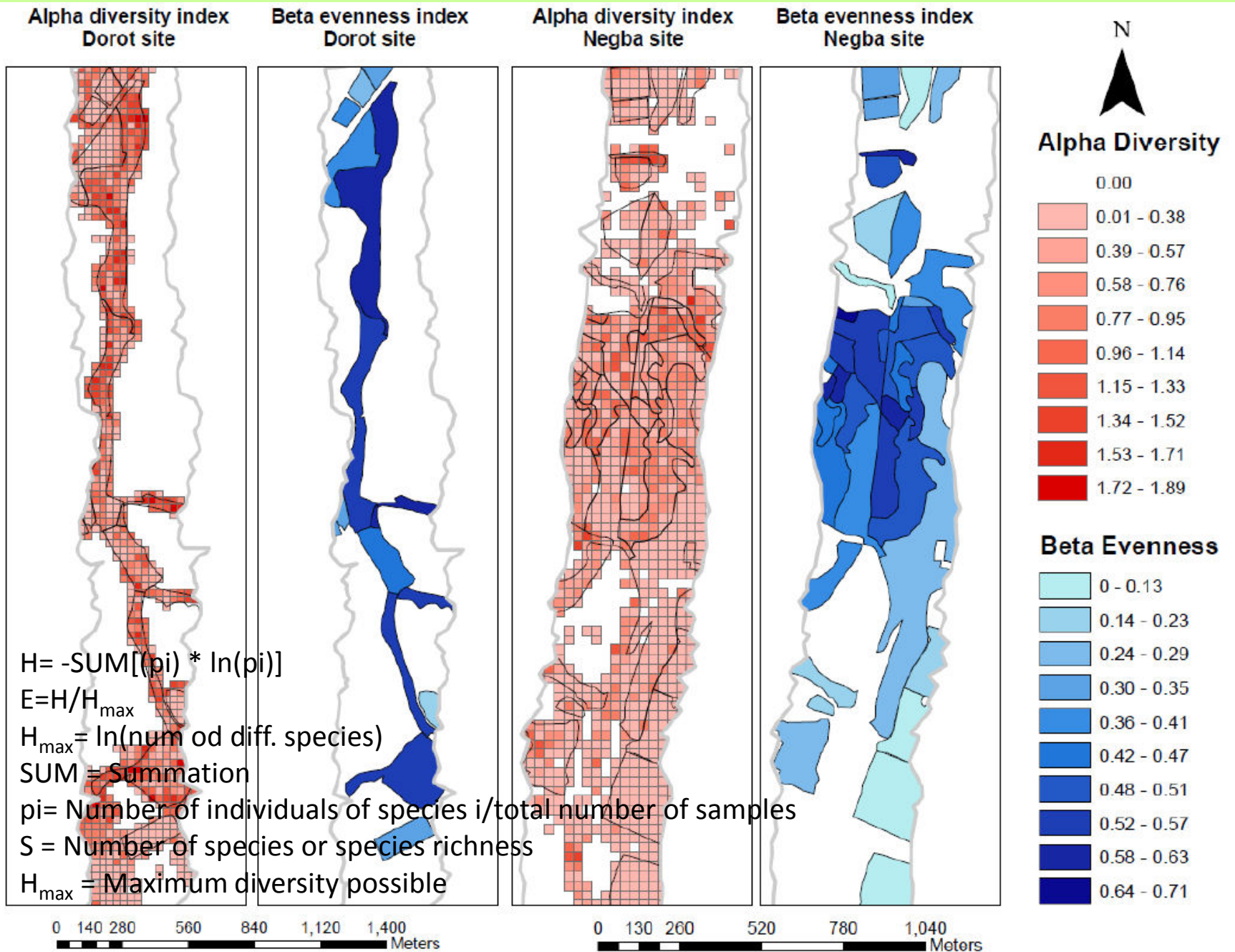
- | | | | | |
|------------|--------------|-----------|--------------|--------------|
| — Acacia | — Amygdaluse | — Bauhin | — Ceratonia | — Citruse |
| — CitruseP | — Crop_1 | — Crop_2 | — Cupressess | — Eucalyptus |
| — Ficus_S | — FicusC | — Jacaran | — Melia | — Oliv |
| — Opointe | — Pinus | — Prunus | — Punica | — Ricinus |
| — Tipuana | — Was | — Zize | — Tamarix | |



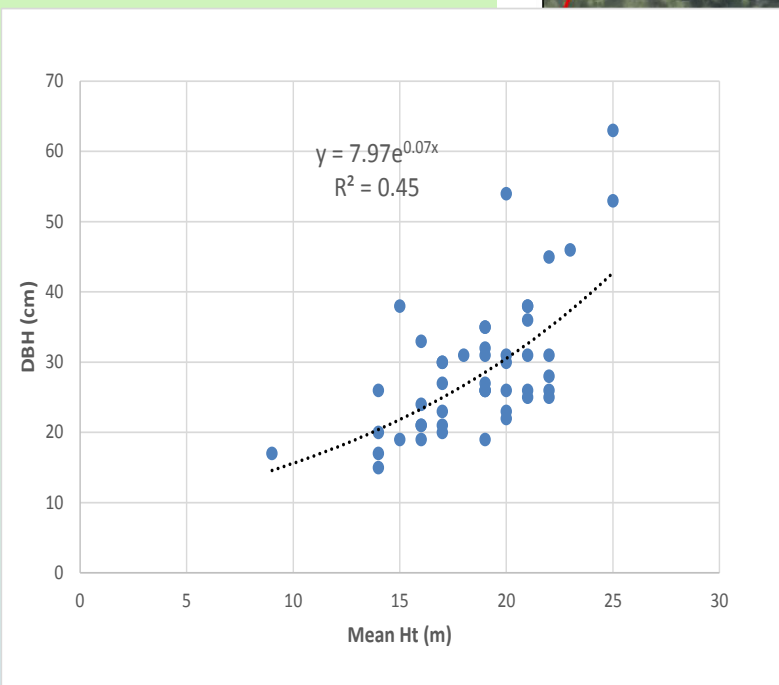
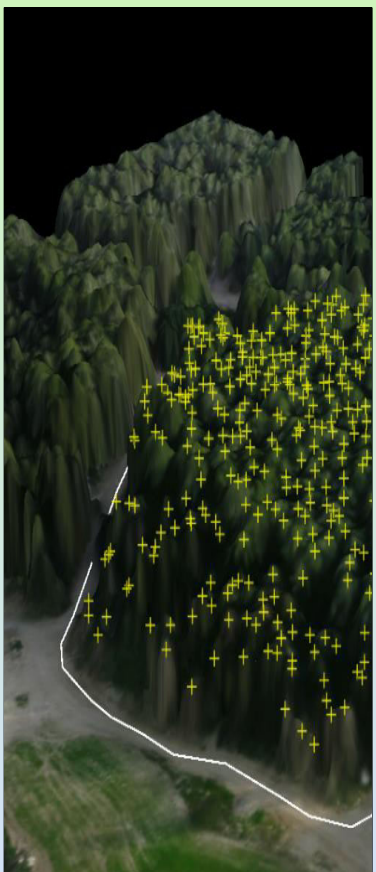
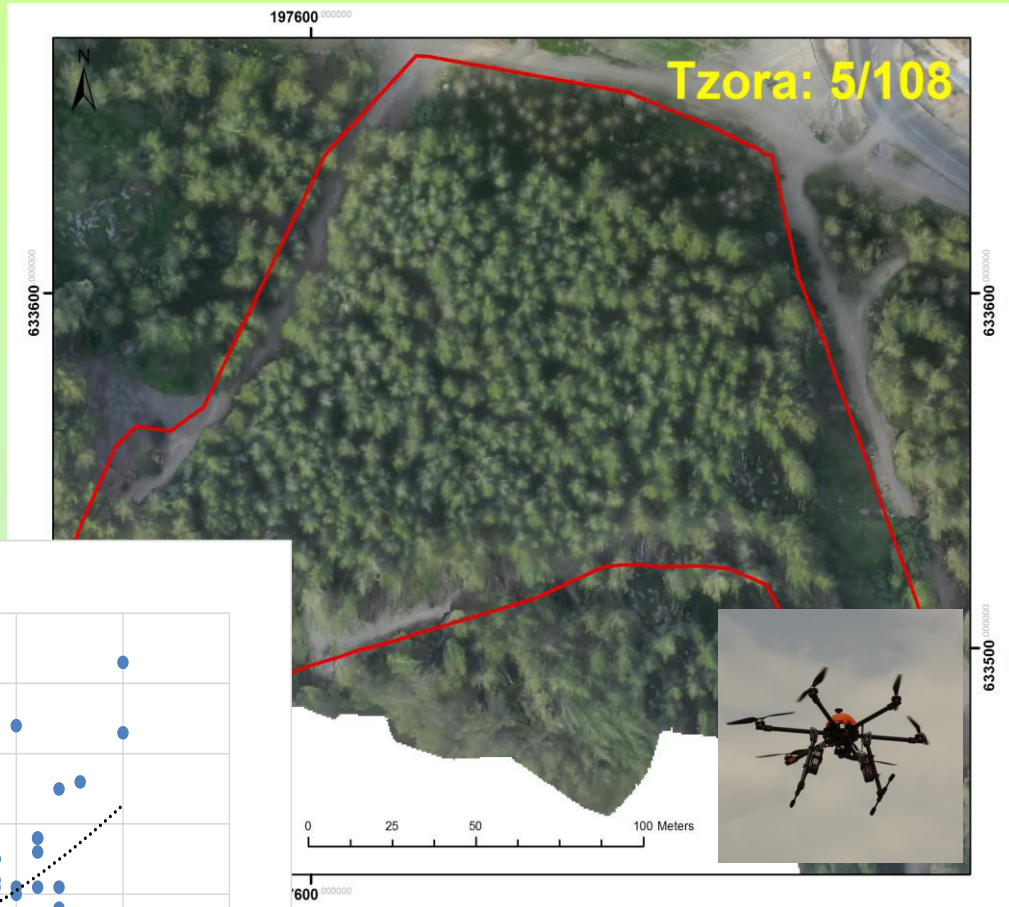
Tree Speaces

Zizophus	Oporenta	Crop_2
Washingtonia	Olive	Crop_1
Tipuana	Melia	Citrus_s
Tamarix	Jacaran	Citrus_c
Ricinus	Ficus_S	Caratonia
Punica	Ficus_c	Amygdalus
Prunus	Eucaliptus	Acica
Pinus	Cupresses	Buhina

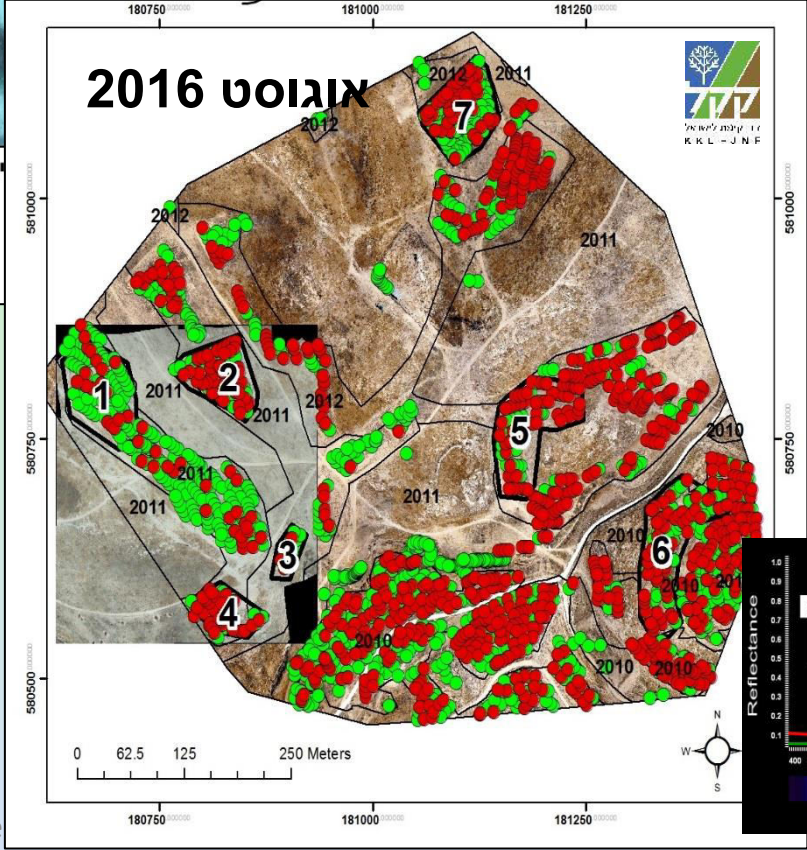
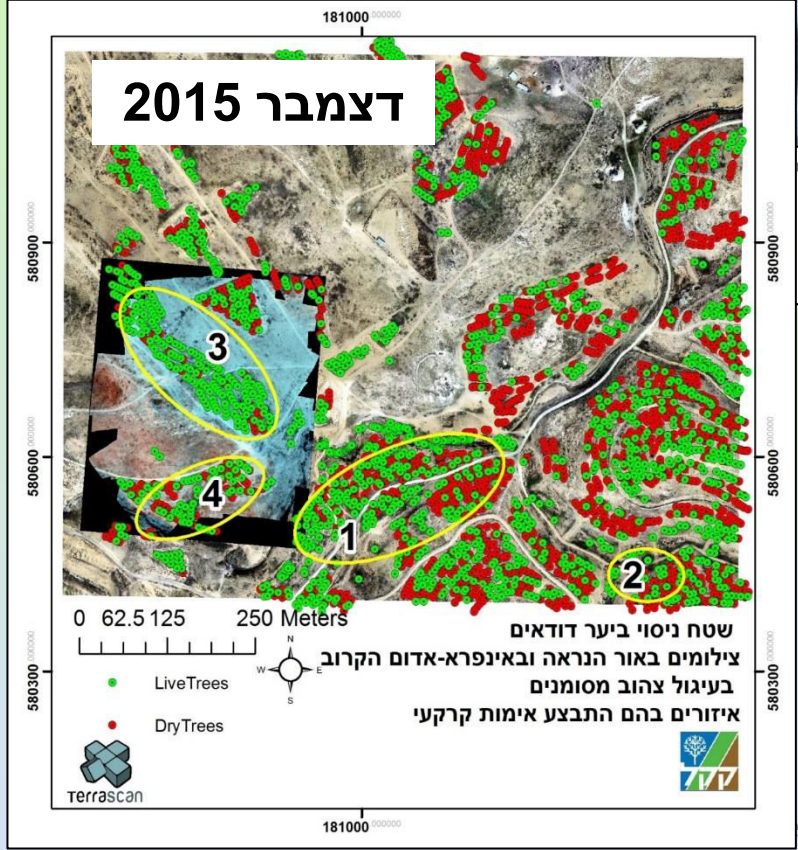
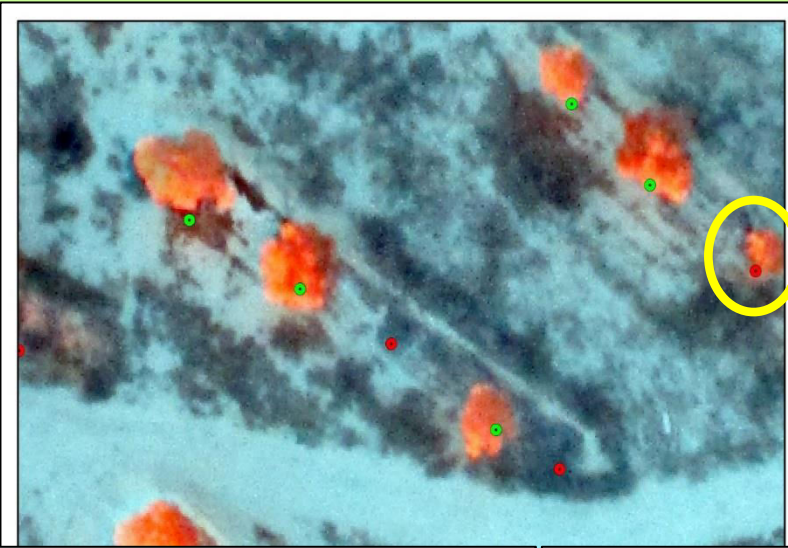




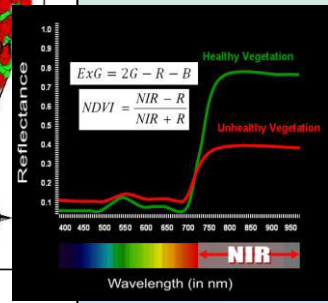
Forest inventory



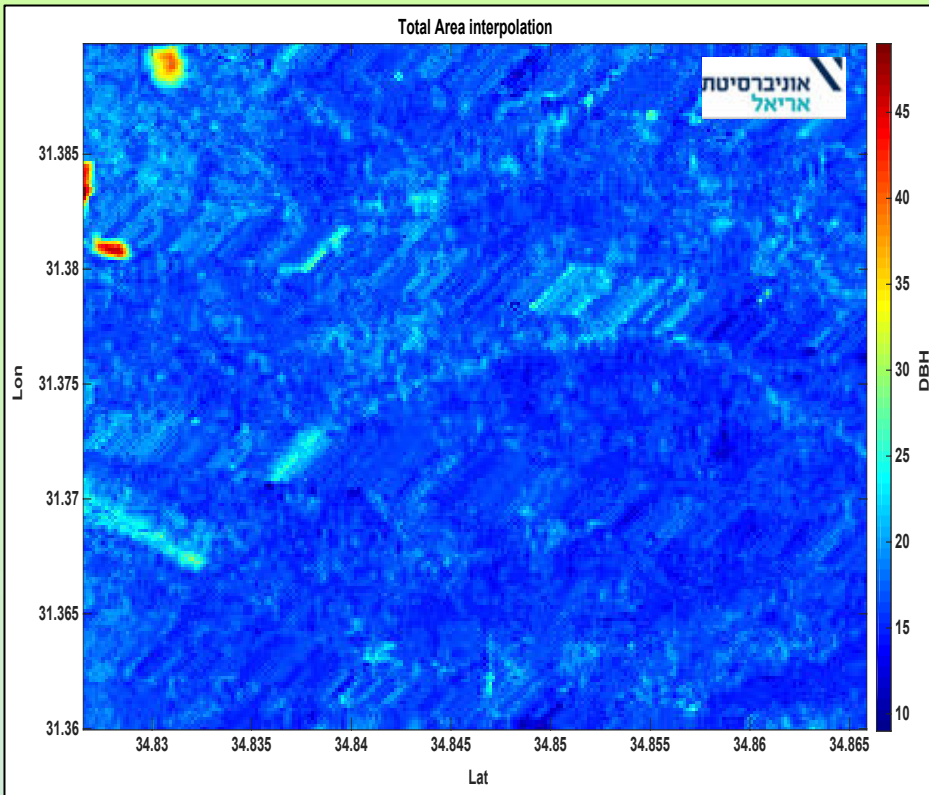
Parameter	Gr. Truth	RS	Abs. error
Mean Ht (m)	19 (± 1.8)	20	-1
TPD	30 (± 8.5)	33	-3
DBH (cm)	30 (± 6)	33	-3



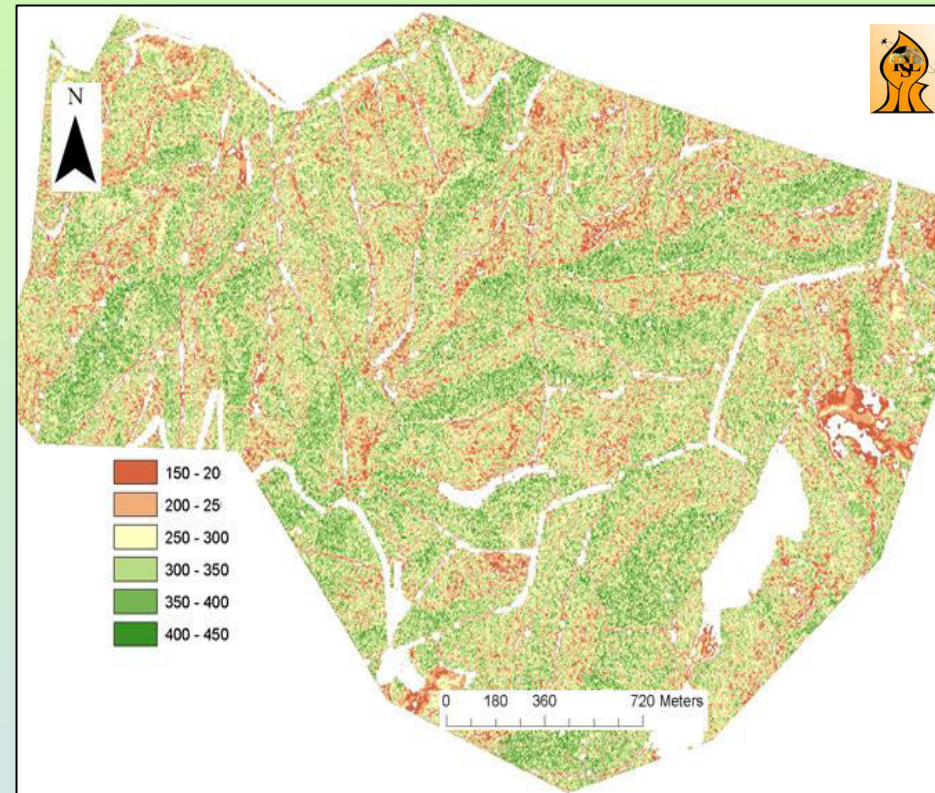
הפרדה בין העצים בתחום הנראה



Forest inventory: Integrating satellites



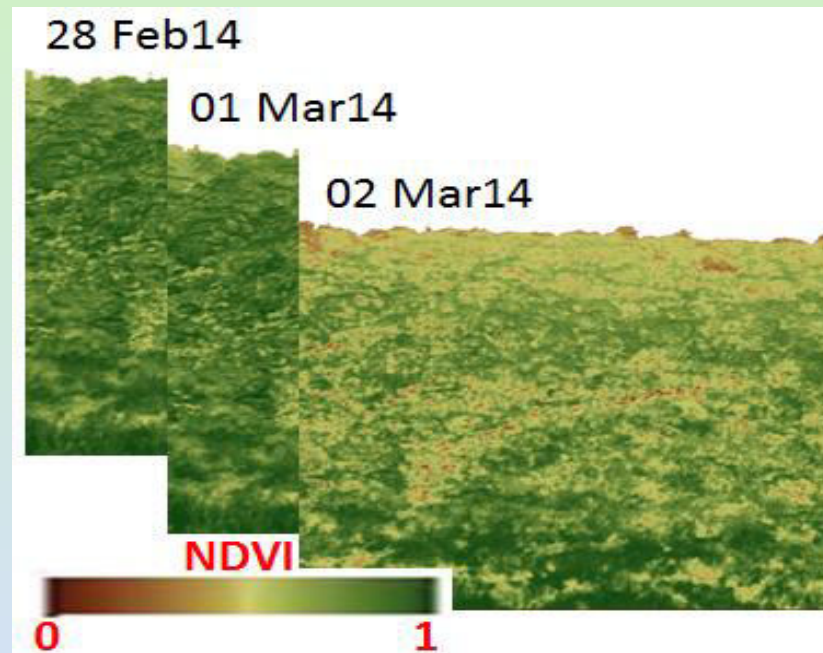
Diameter at Breast Height



Stand Density

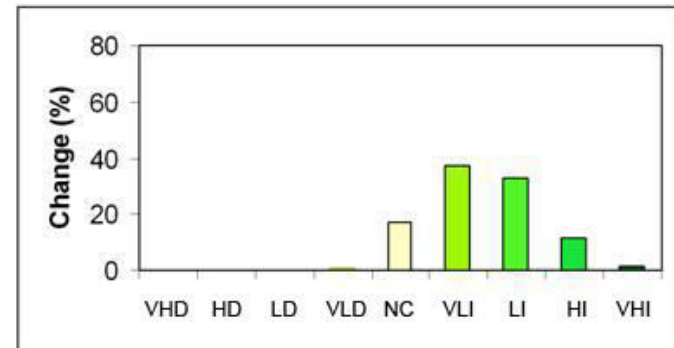
Ecosystem monitoring

Remote Sensing

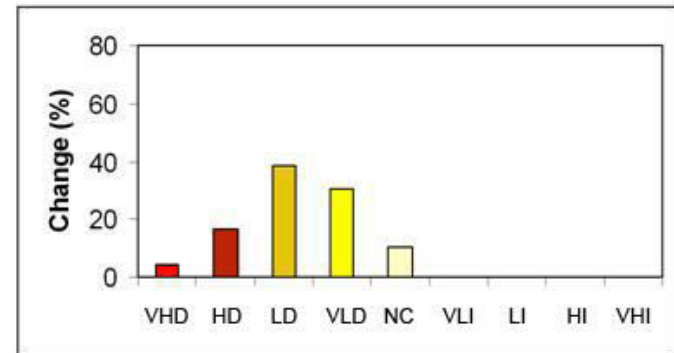




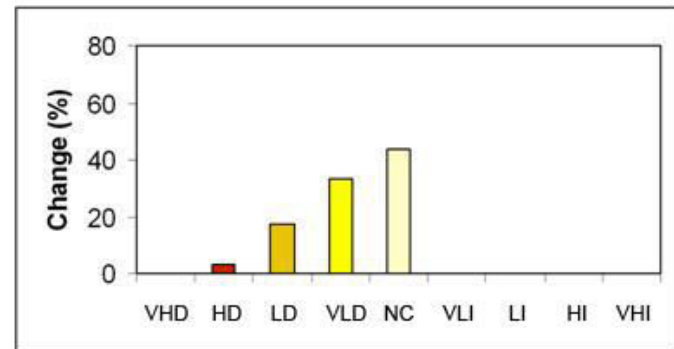
A Nov. 24, 1994 – Dec. 21, 1994



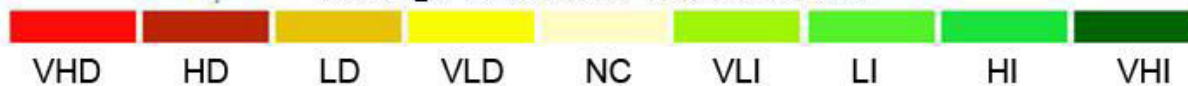
B Jan. 24, 1995 – Jun. 17, 1995

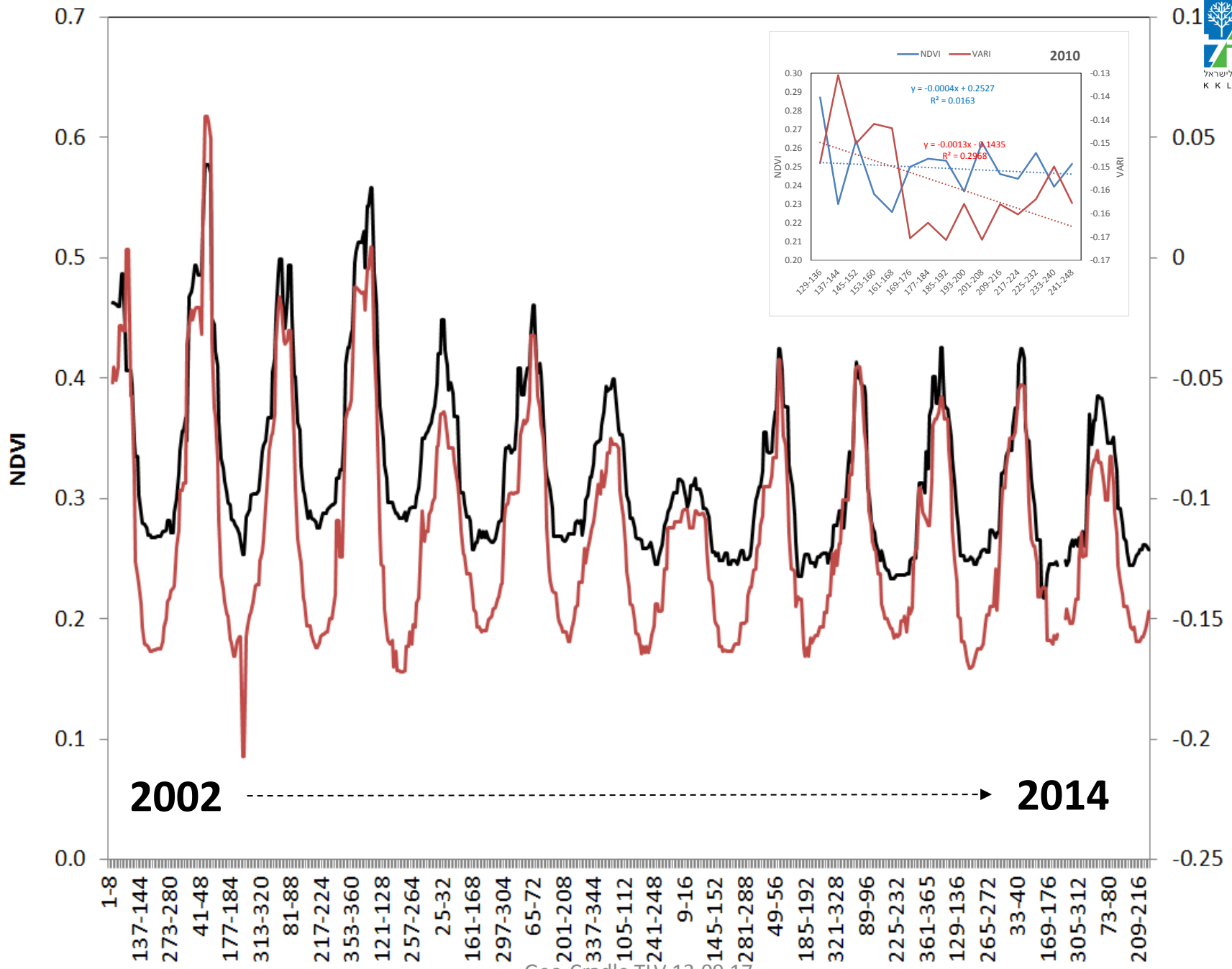


C Jan. 14, 2000 – May 21, 2000



Change Detection Classification





Rainfall: 250 – 900mm

Elevation: 40 – 900m

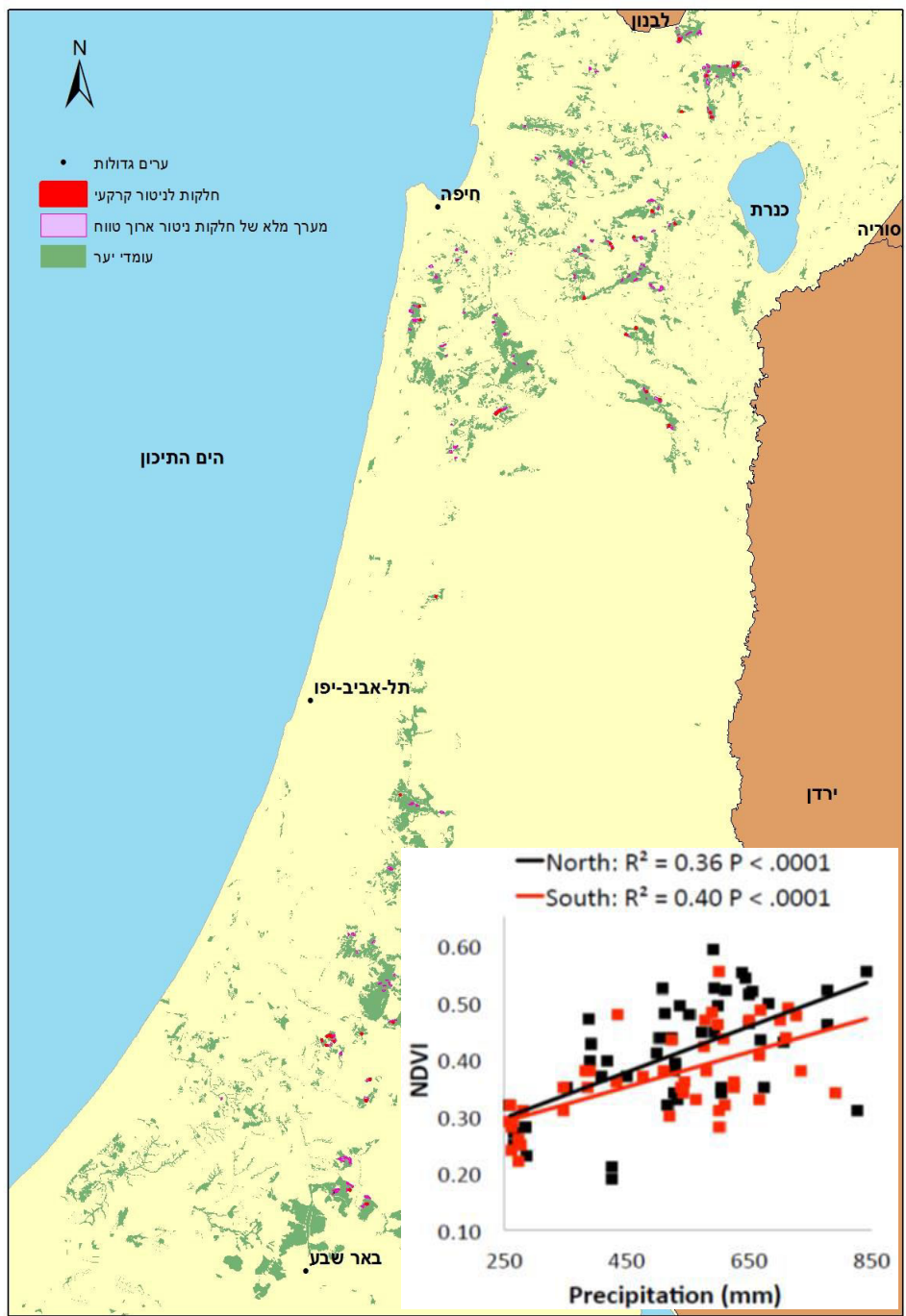
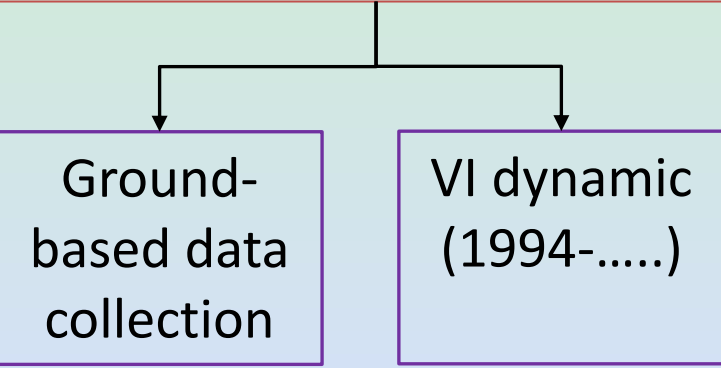
Bedrock: Hard, Soft

Aspect: North, South

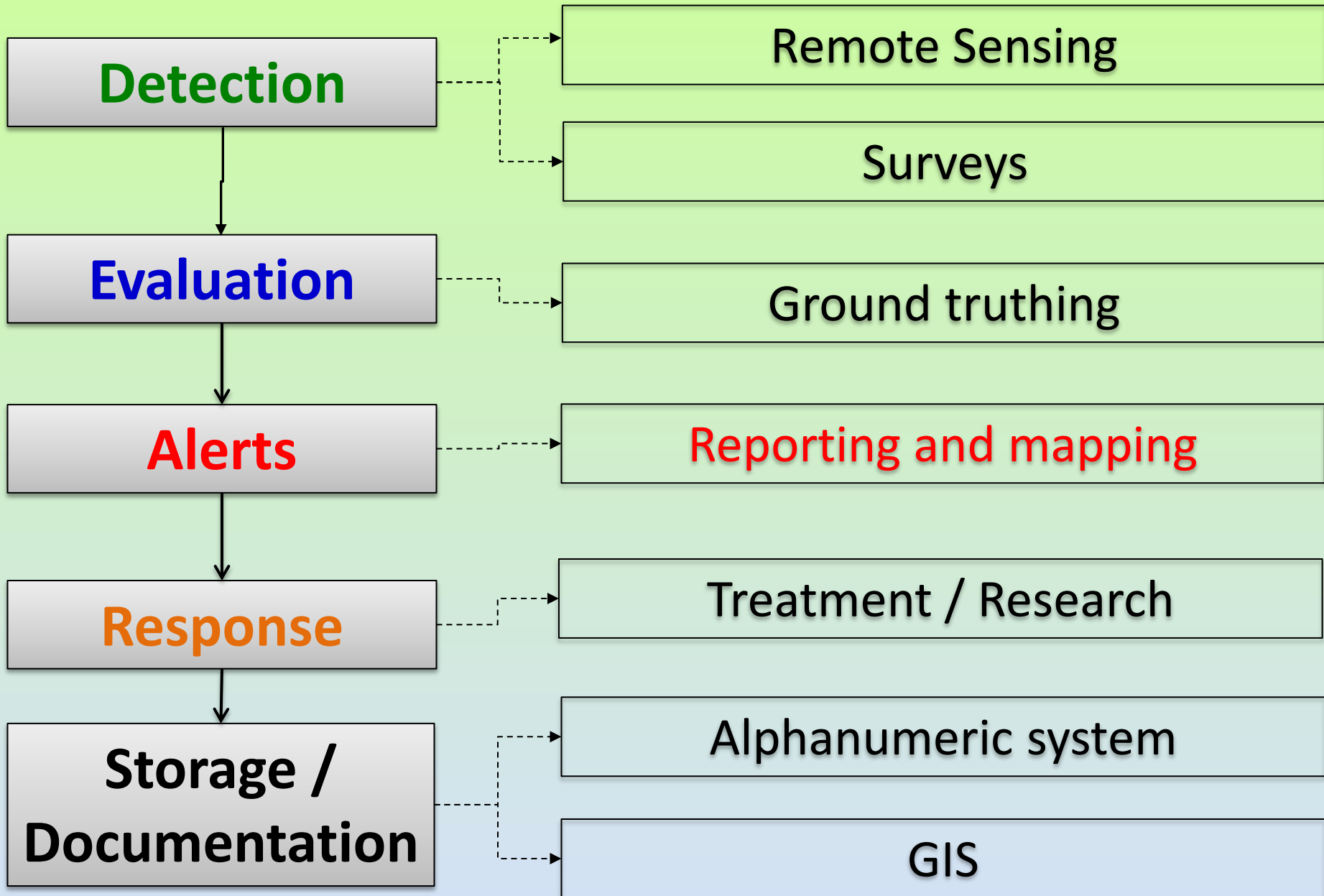
**Forest type: *Halepensis*,
*Brutia***

80

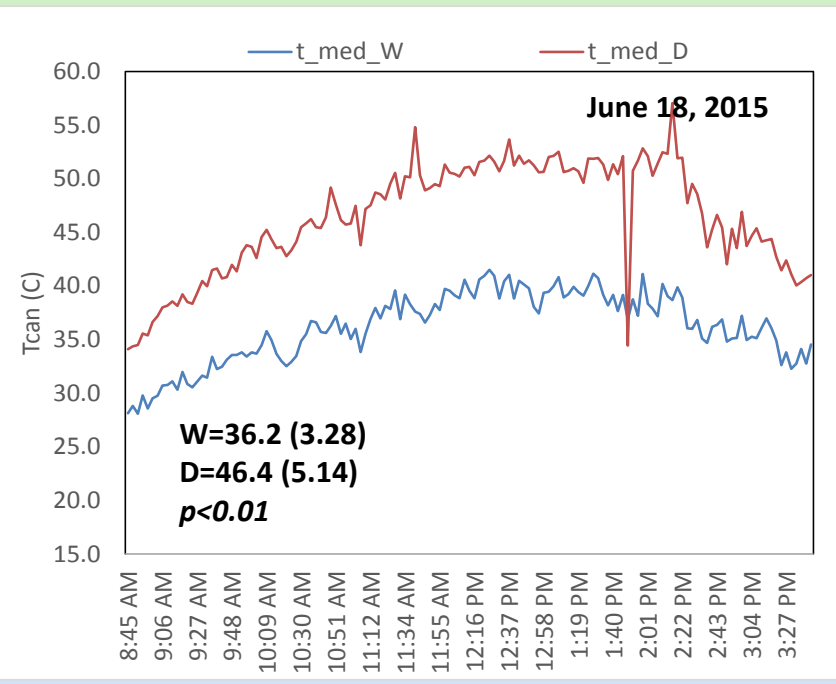
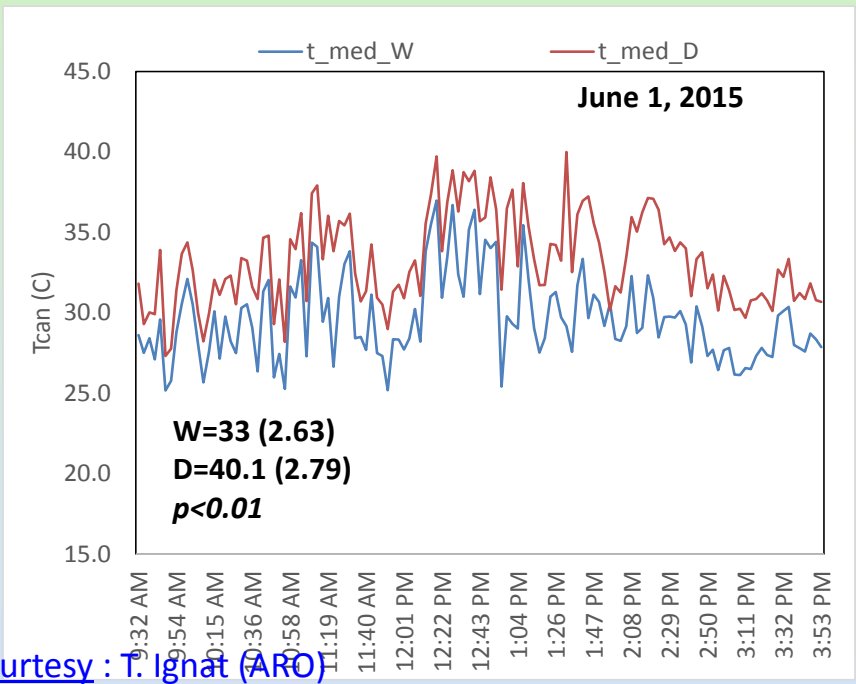
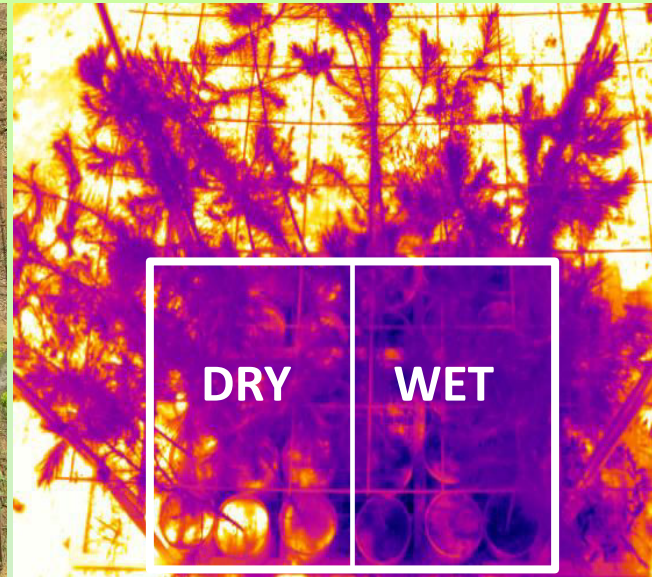
- Dynamics of woody vegetation
- Identifying threats
- Management strategy development



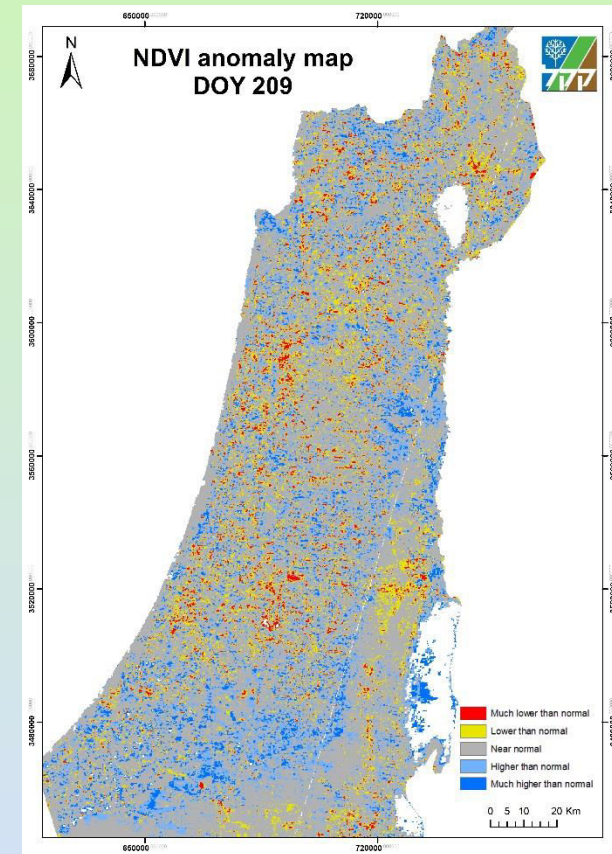
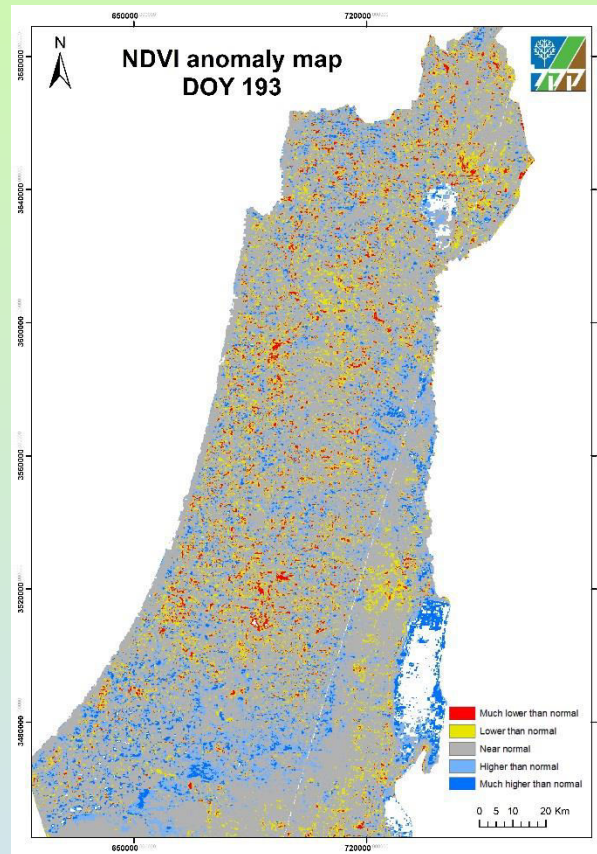
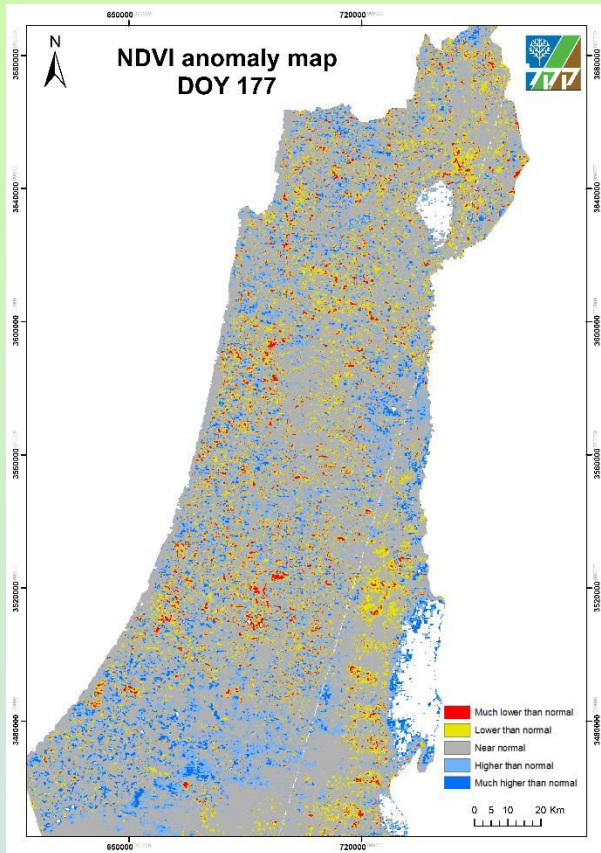
Forest Health Monitoring

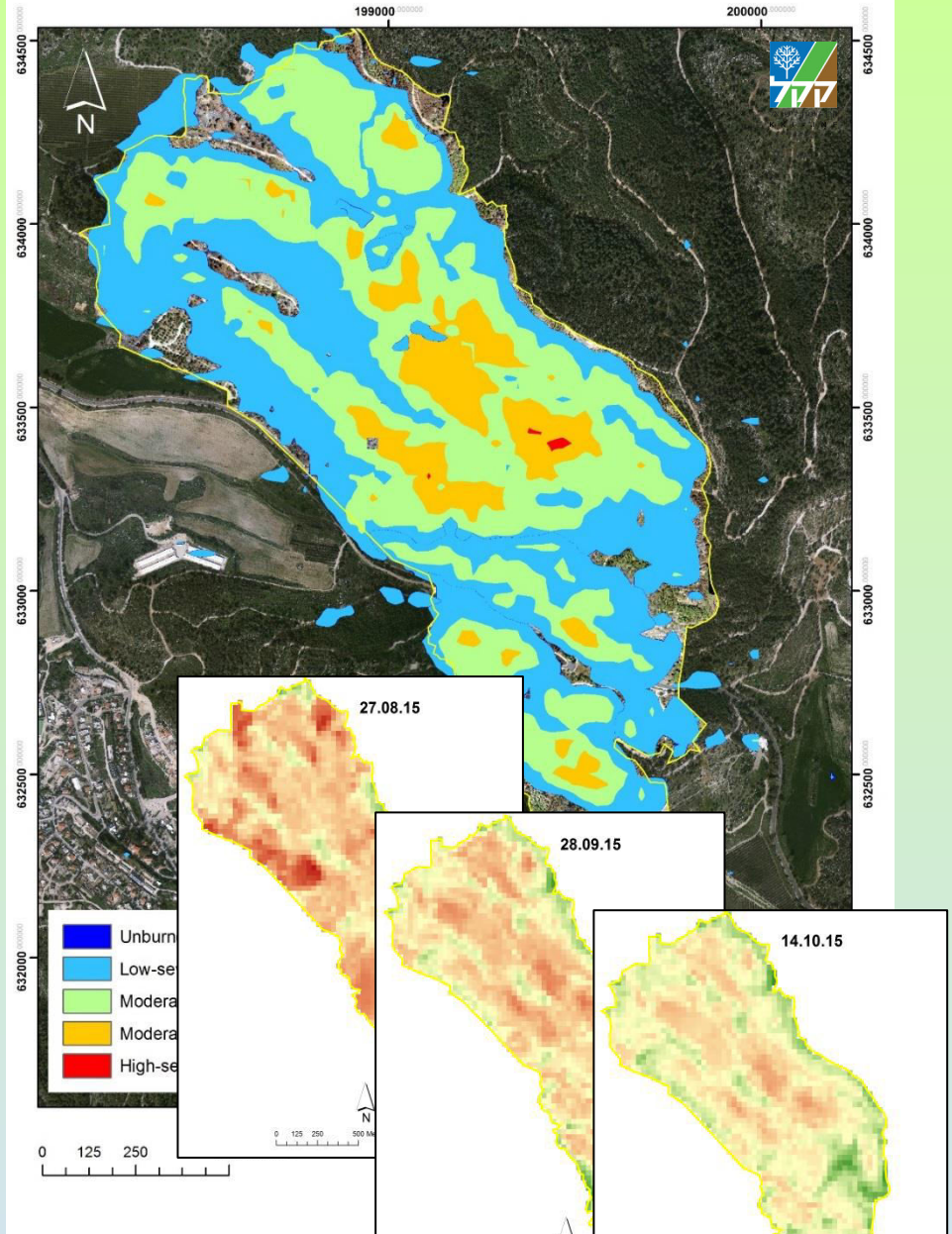
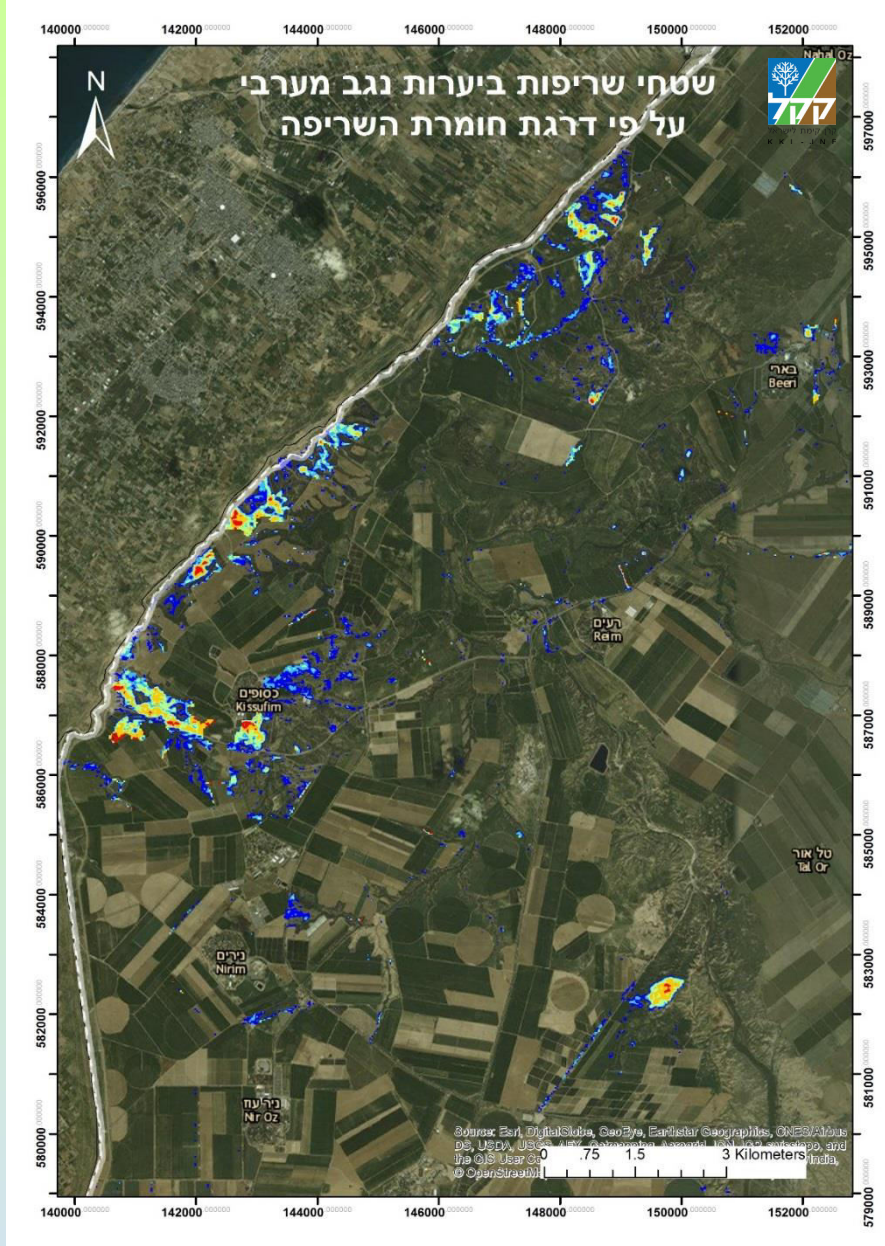


Forest Health Monitoring: Canopy Temperature



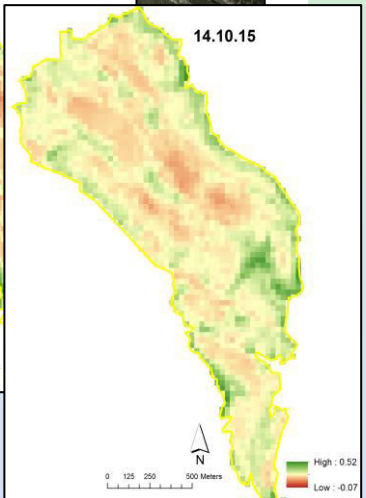
Forest Health Monitoring: NDVI anomaly





$$NBR = (NIR - SWIR) / (NIR + SWIR)$$

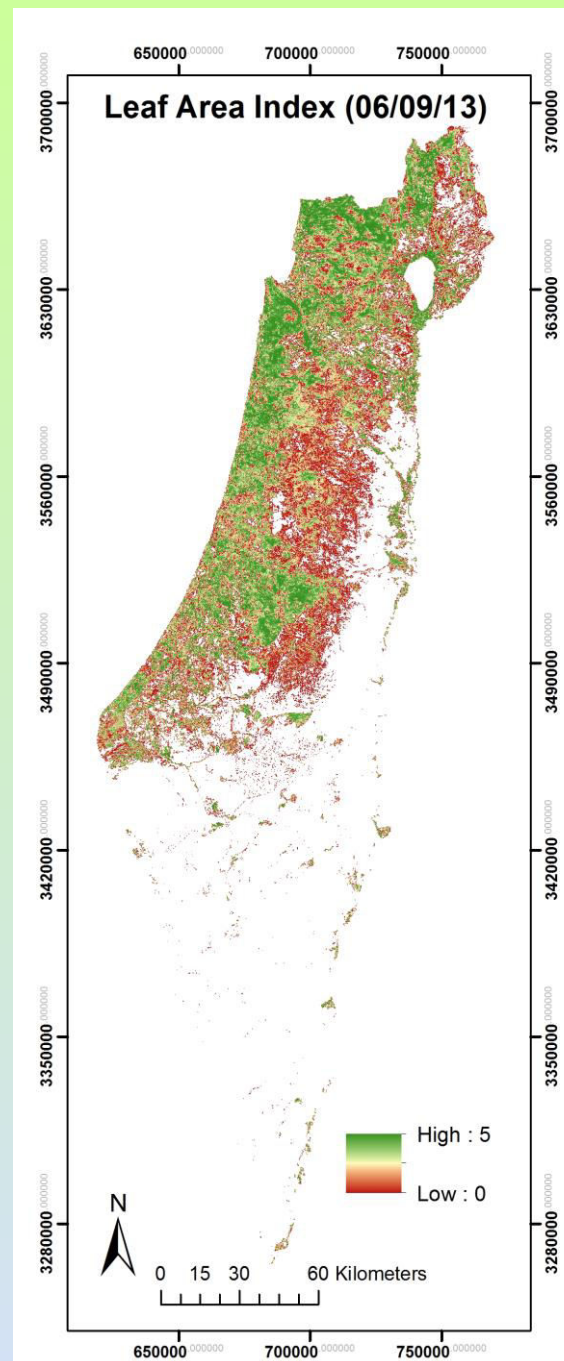
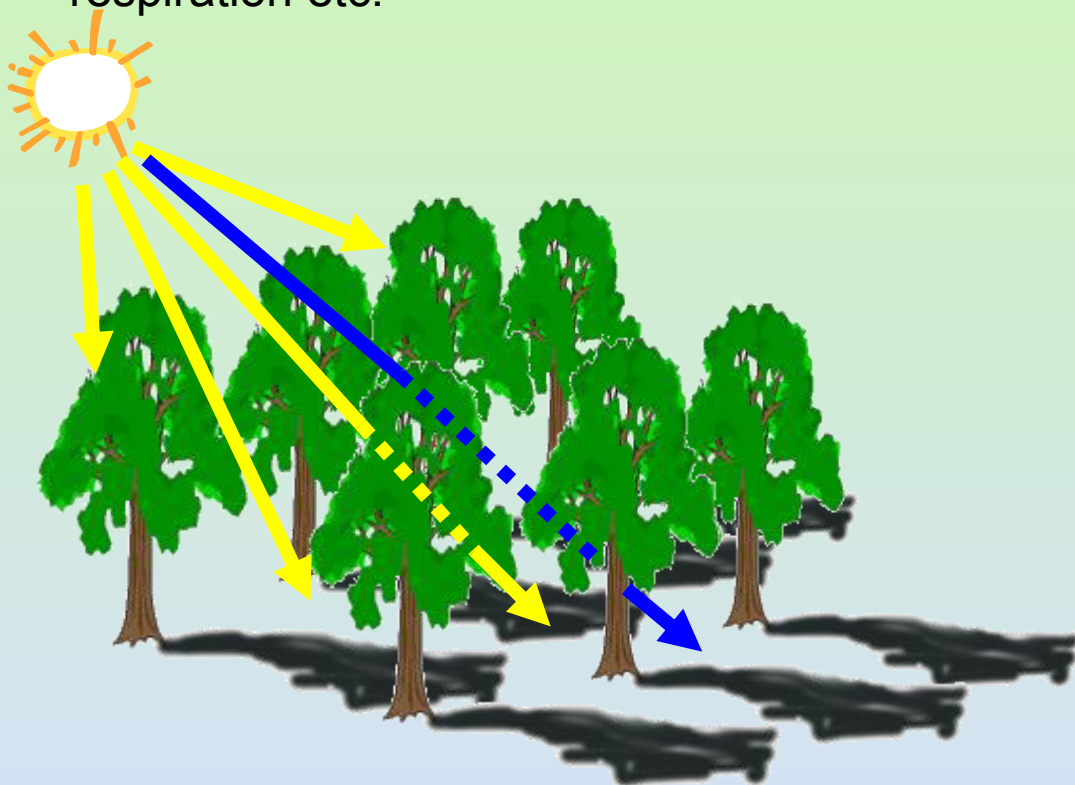
$$dNBR = NBR_{prefire} - NBR_{postfire}$$



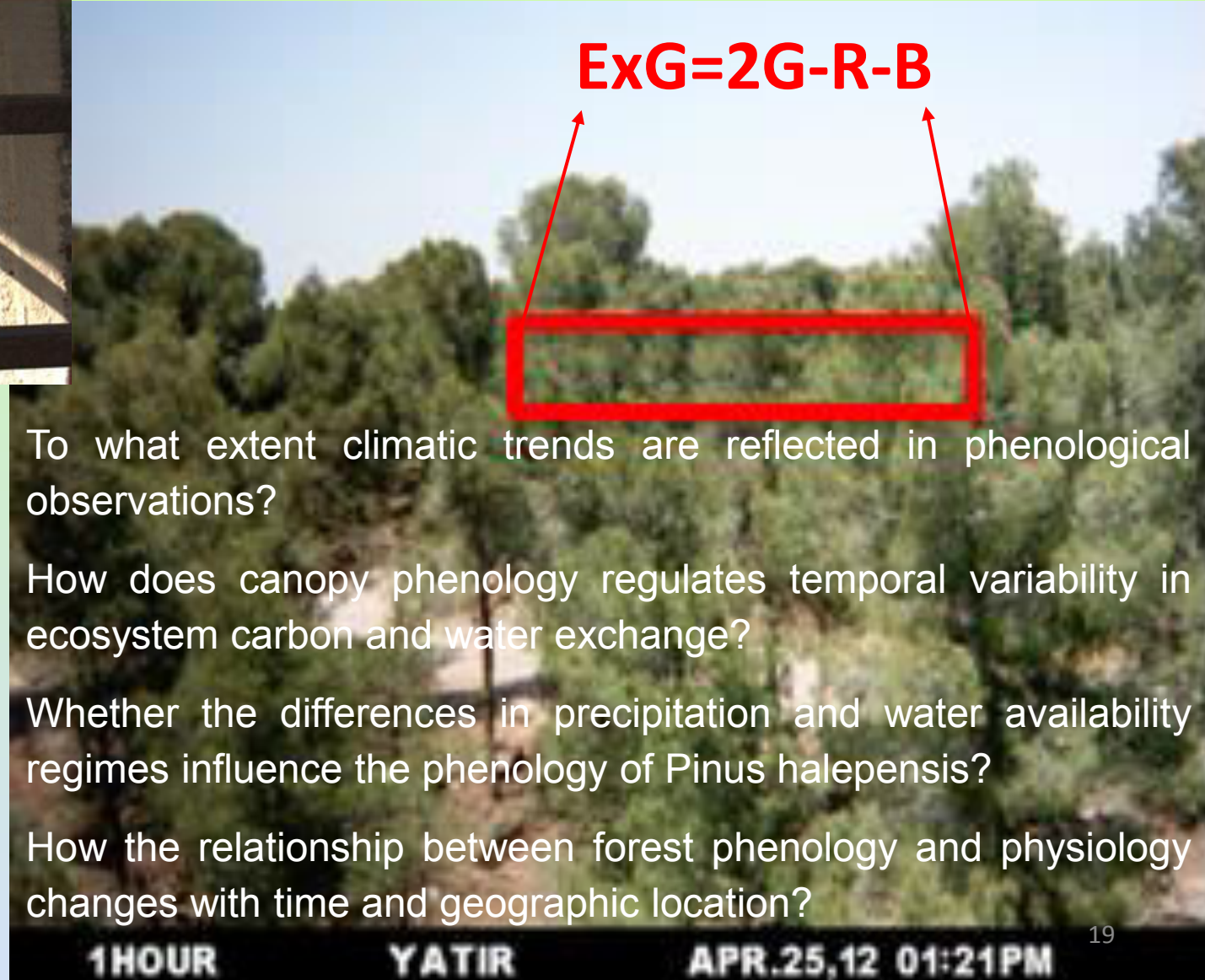
Leaf Area Index

Highly related to many canopy processes, such as:

- water interception,
- evapotranspiration,
- photosynthesis,
- respiration etc.



Phenological monitoring



To what extent climatic trends are reflected in phenological observations?

How does canopy phenology regulates temporal variability in ecosystem carbon and water exchange?

Whether the differences in precipitation and water availability regimes influence the phenology of *Pinus halepensis*?

How the relationship between forest phenology and physiology changes with time and geographic location?

Up-to-date information

```
graph TD; A[Up-to-date information] --> B[Mapping]; A --> C[Inv. & Monitoring]; A --> D[Functioning]; B --> E[Adaptive management]; C --> E; D --> E; E --> F[Healthy Forest]
```



Mapping

**Inv. &
Monitoring**

Functioning



Adaptive management



Healthy Forest

A gravel road lined with pine trees under a clear blue sky. The road is paved with light-colored gravel and stretches into the distance, flanked by tall, green pine trees. The sky is a clear, bright blue. The overall scene is peaceful and scenic.

Thank you

Supporting slides

Methods of geodata collection

Remote

Ground based

Forest health monitoring

**Forest fire monitoring and
mapping**

Inventory and special surveys

Central database

(geographic and alphanumeric)

Forest management planning

(long and short term)



Information: KKL-JNF

- The oldest and the biggest “green” organization in Israel (since 1901)
- NGO – operates as a national forest service



115 years of land restoration and development activities, afforestation and nature conservation projects

Land

- purchased over 260000 ha of land
- more that 100000 ha have been prepared for agric.
- more than 7000 km of roads construction

Water

> 250 reservoirs and dams to collect rainwater and recycled water

Forest

- > 260000000 trees have been planted all over the country (> ~1200000 du)
- 800 recreation areas

Отправная точка деятельности ККЛ-ЕНФ в Израиле:



“Из всех непривлекательных стран, Палестина, я думаю, должна быть чемпионом. Холмы голые, тусклые и некрасивой формы. Долины - всего лишь немиловидная пустыня, окаймленная чахлой растительностью. Мертвое и Галилейское моря спят среди бескрайних холмов и равнин, где глаз не может остановиться ни на одном ярком пятнышке..

Это блеклая, безнадежная, безрадостная страна.”

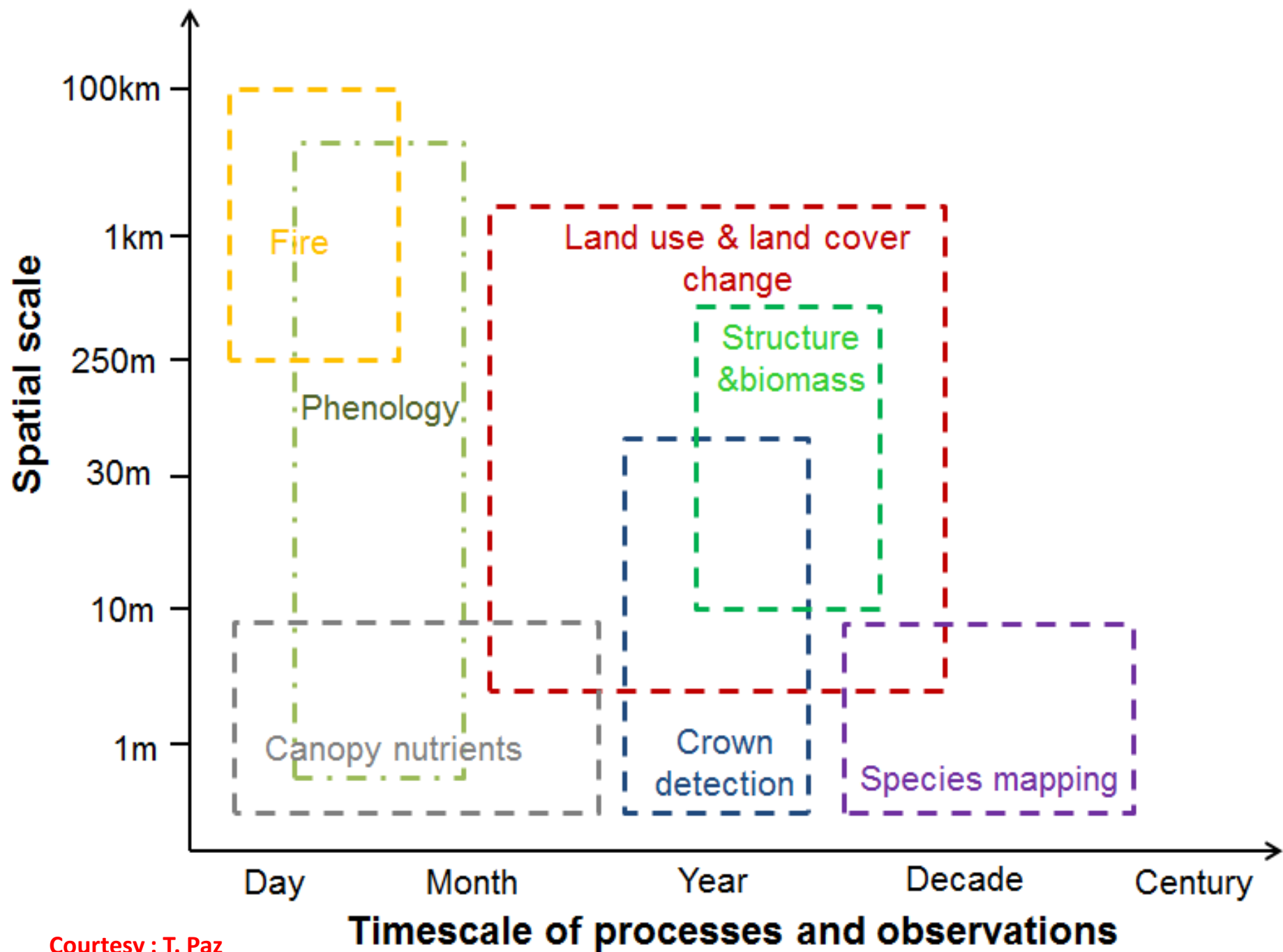
“Простаки за границей” Марк Твен (1869)



Biodiversity





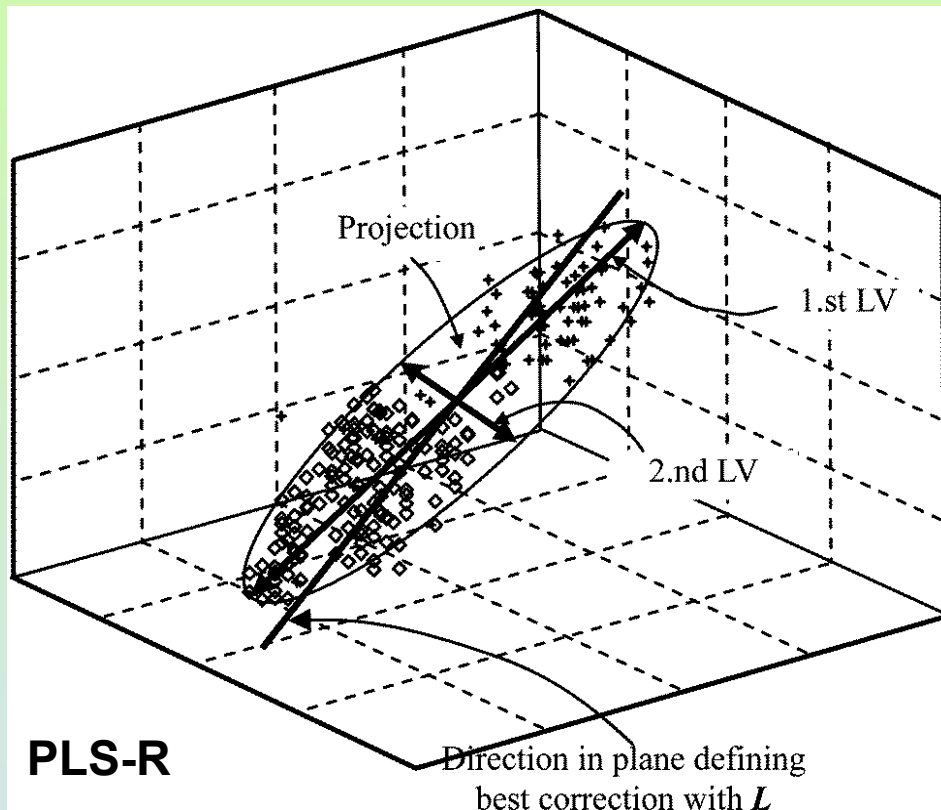


Courtesy : T. Paz



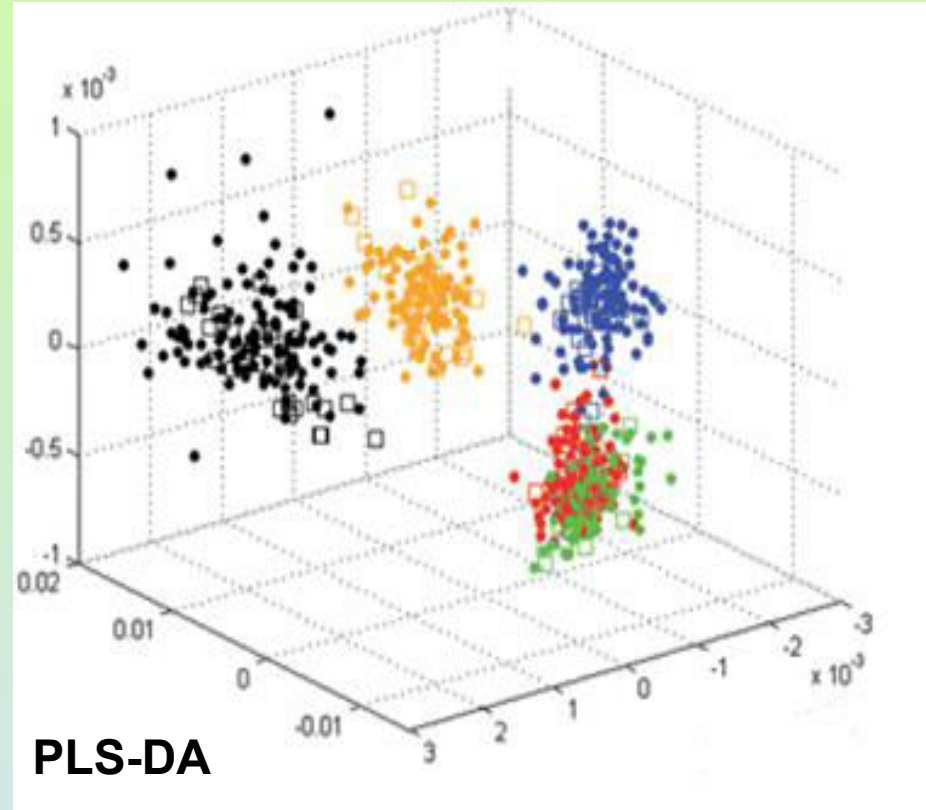
Statistical analysis

Partial least squares regression



Correlates the spectral data with the chemical or physical measurements.

Partial least squares discriminant analysis

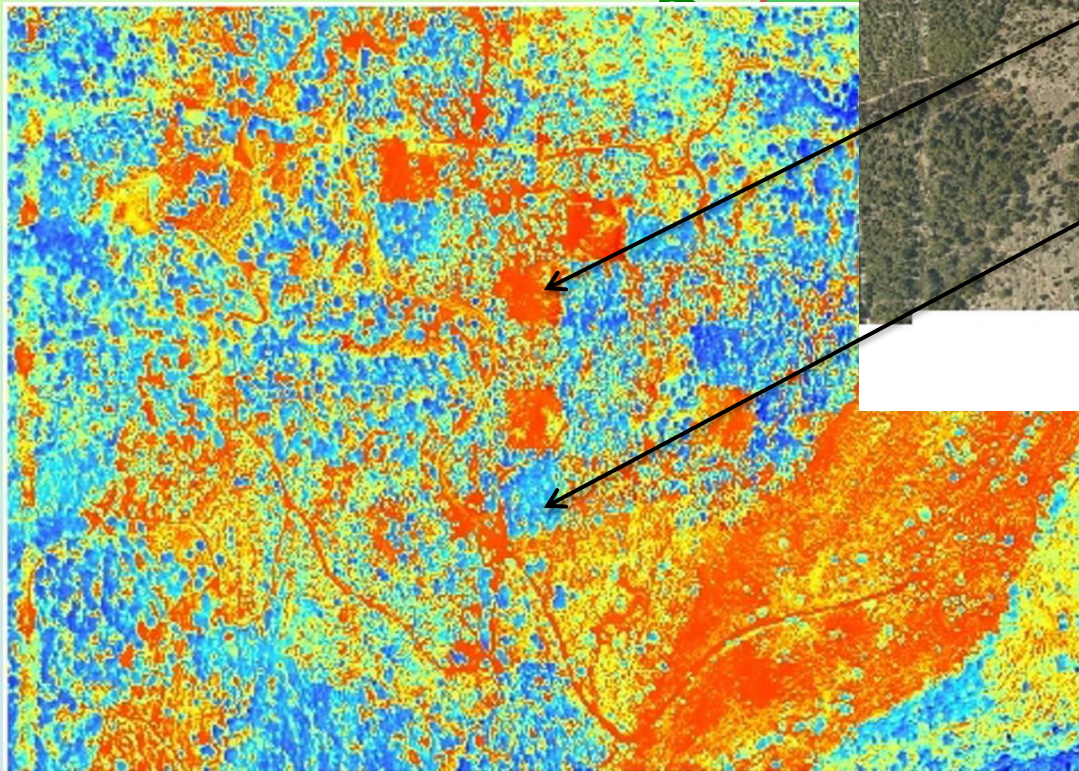


Determines and classifies the known classes in a calibration set

Max



0 62.5125 250 Meters



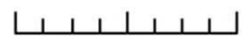
Surface tepmerature



High: 44.5

Low: 26.8

0 62.5125 250 Meters

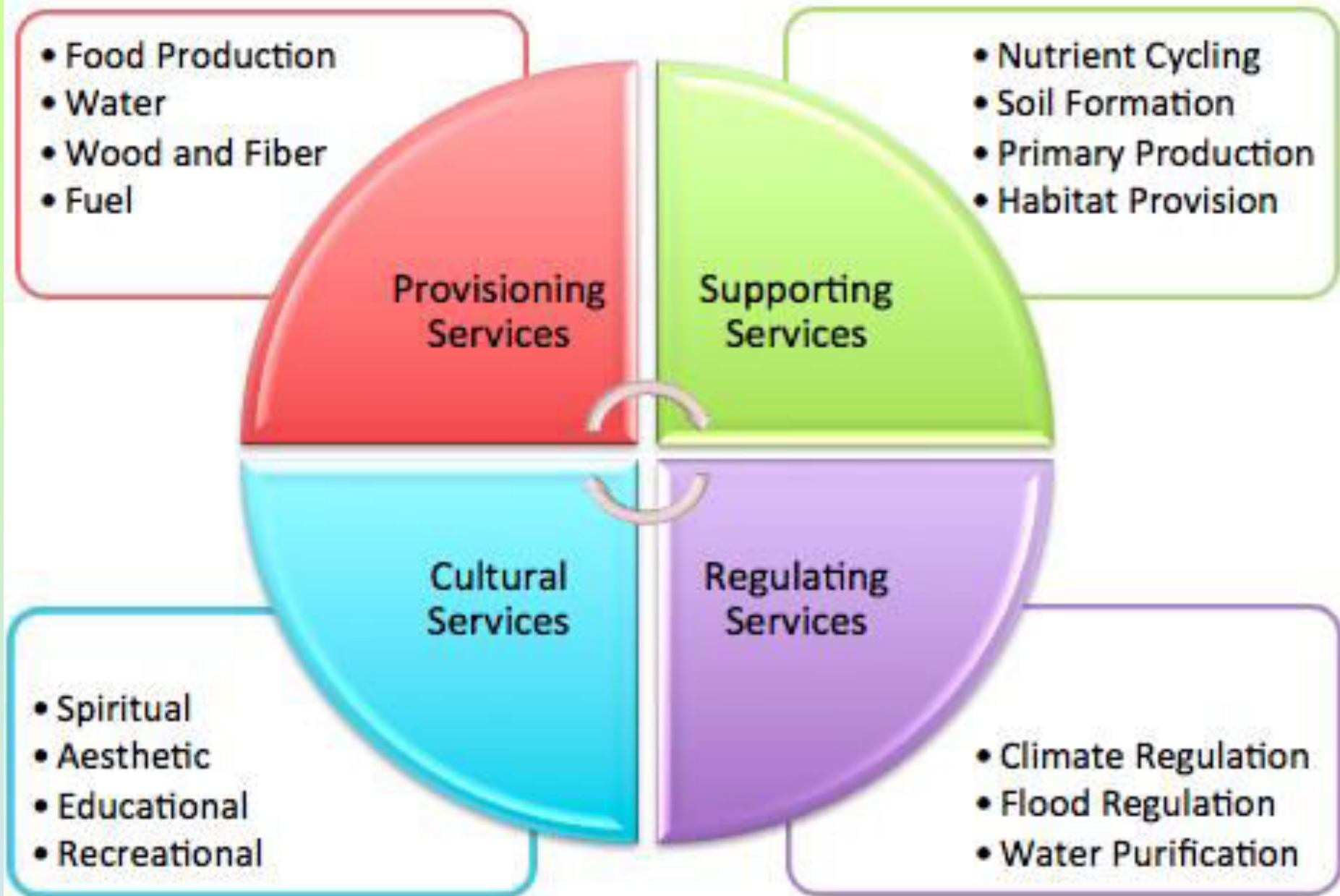


nce

RSAC-KKL join meeting 17.02.2016

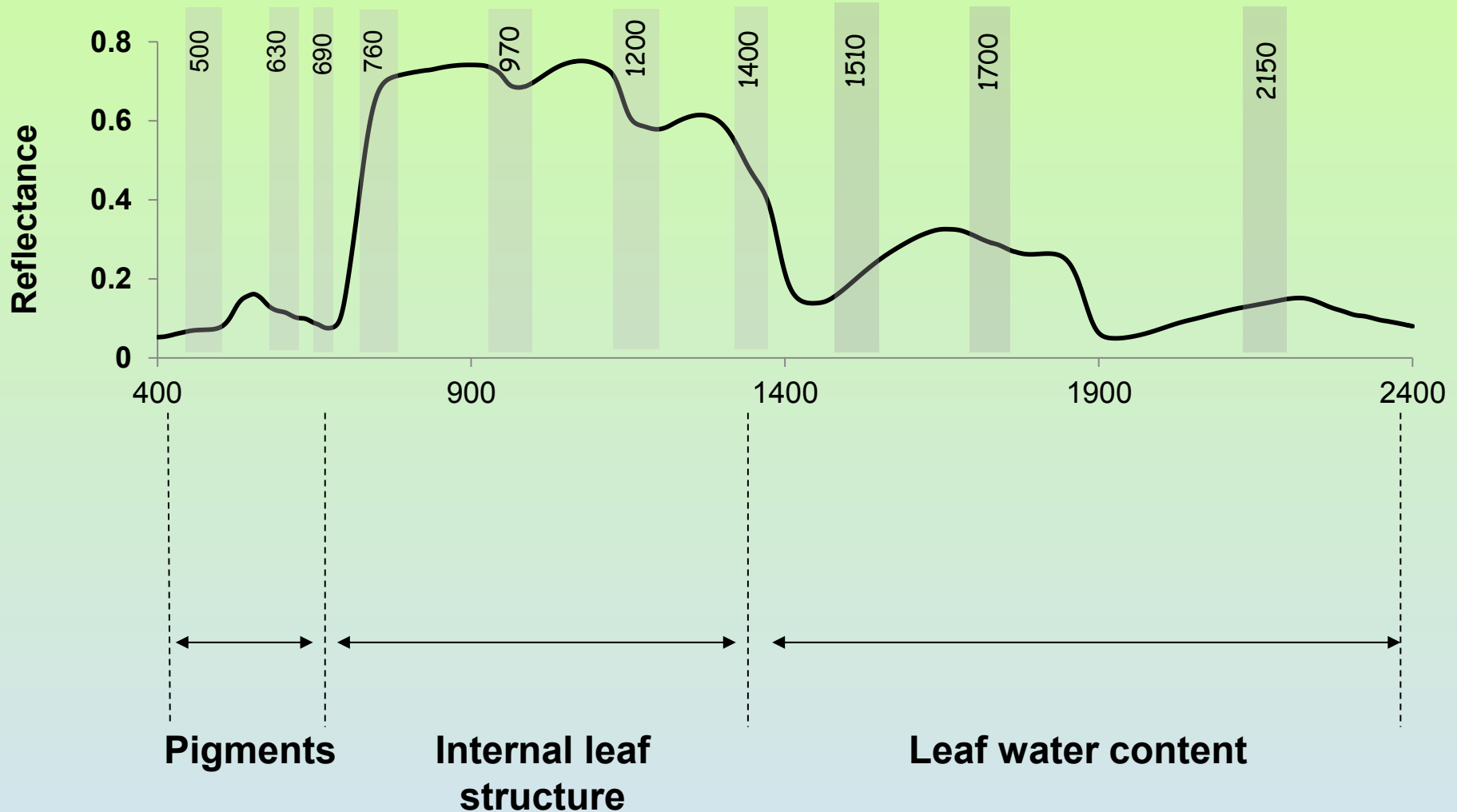
Max

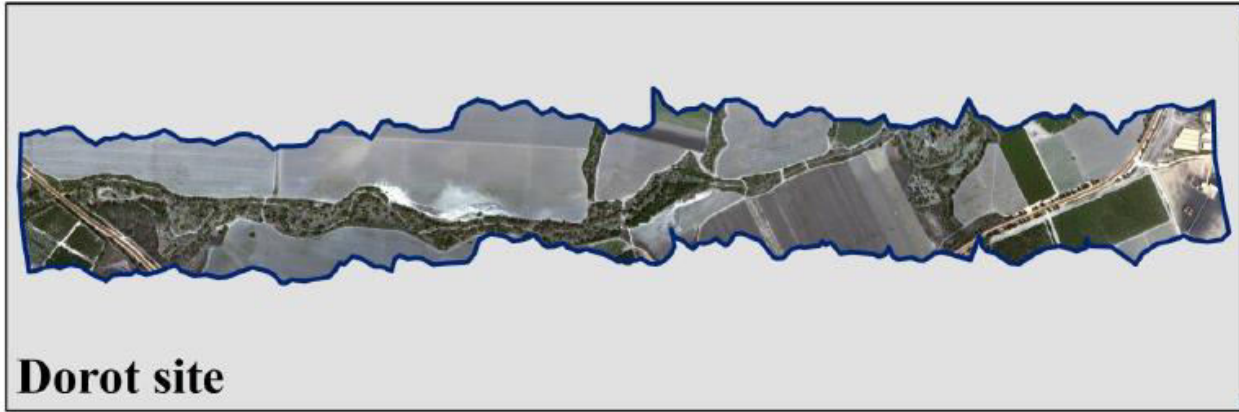
Max



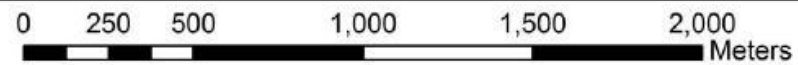
Source: Millenium Ecosystem Assessment, 2005.

Spectral signature of a healthy leaf

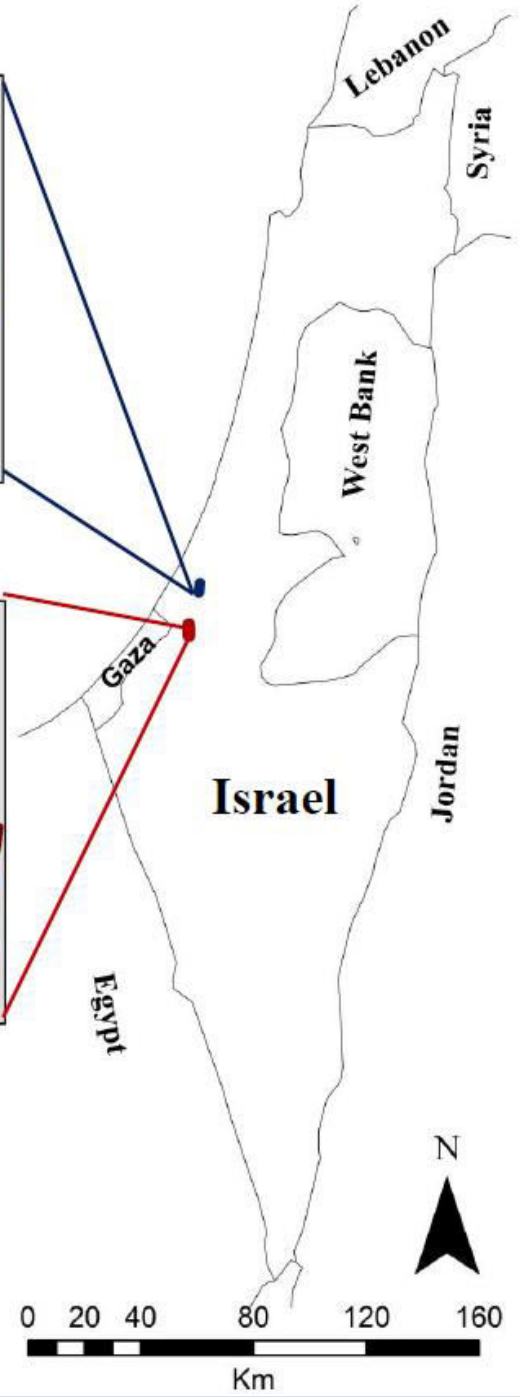
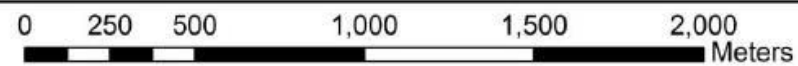




Dorot site



Negba site



STAND DENSITY

degree of stem crowding within a stocked area

ABSOLUTE

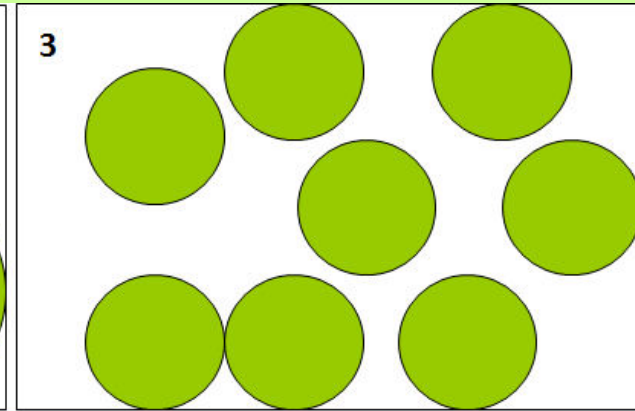
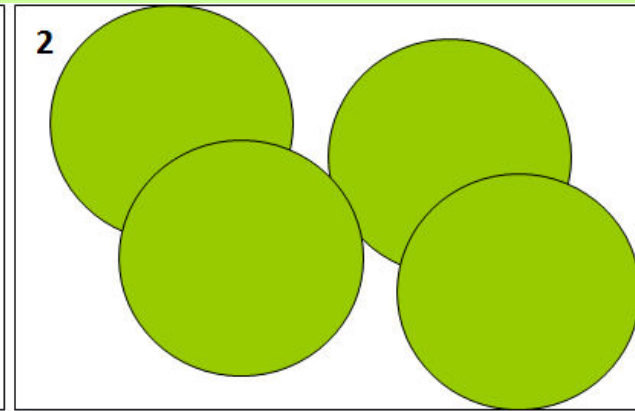
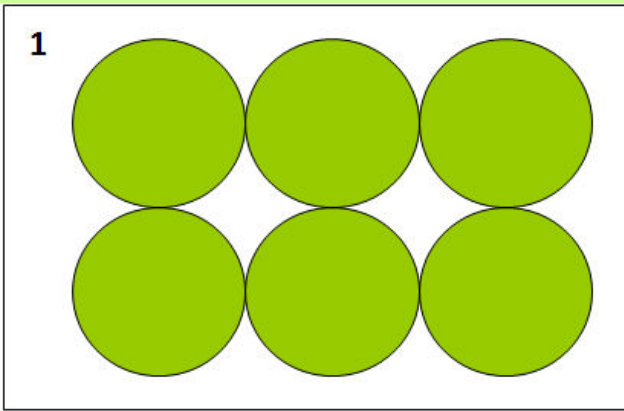
Trees **P**er
unit **A**rea

Basal
Area

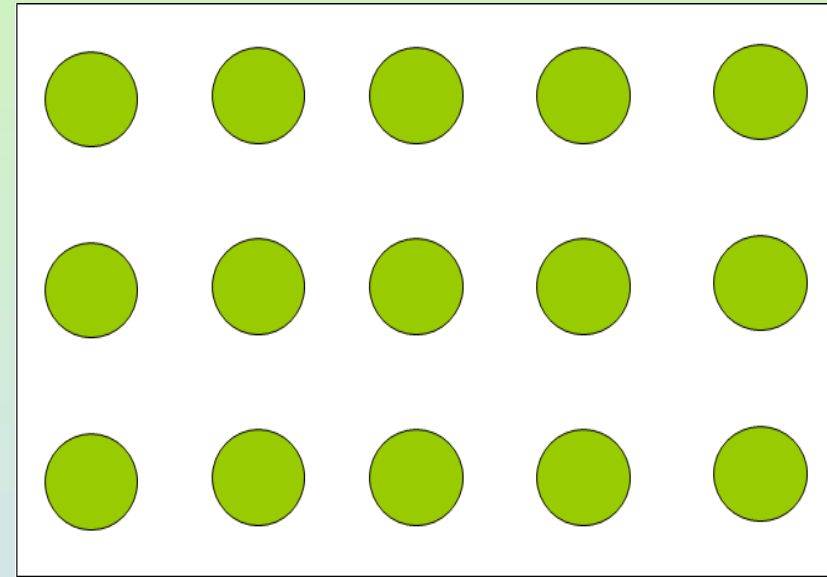
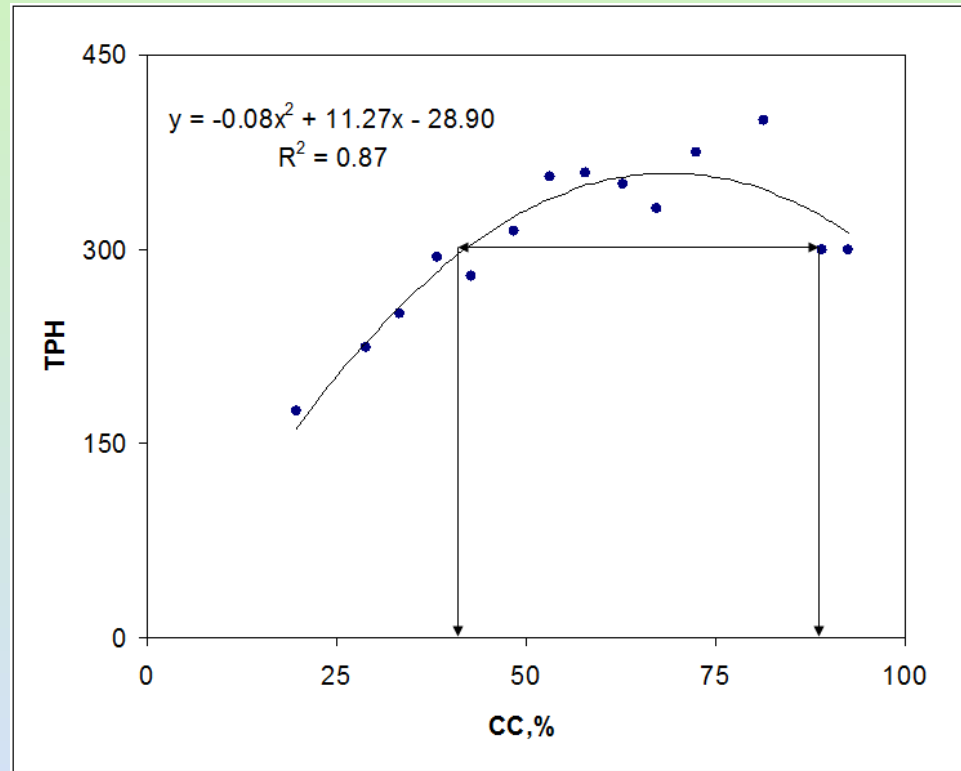
RELATIVE

Crown
Competition
Factor

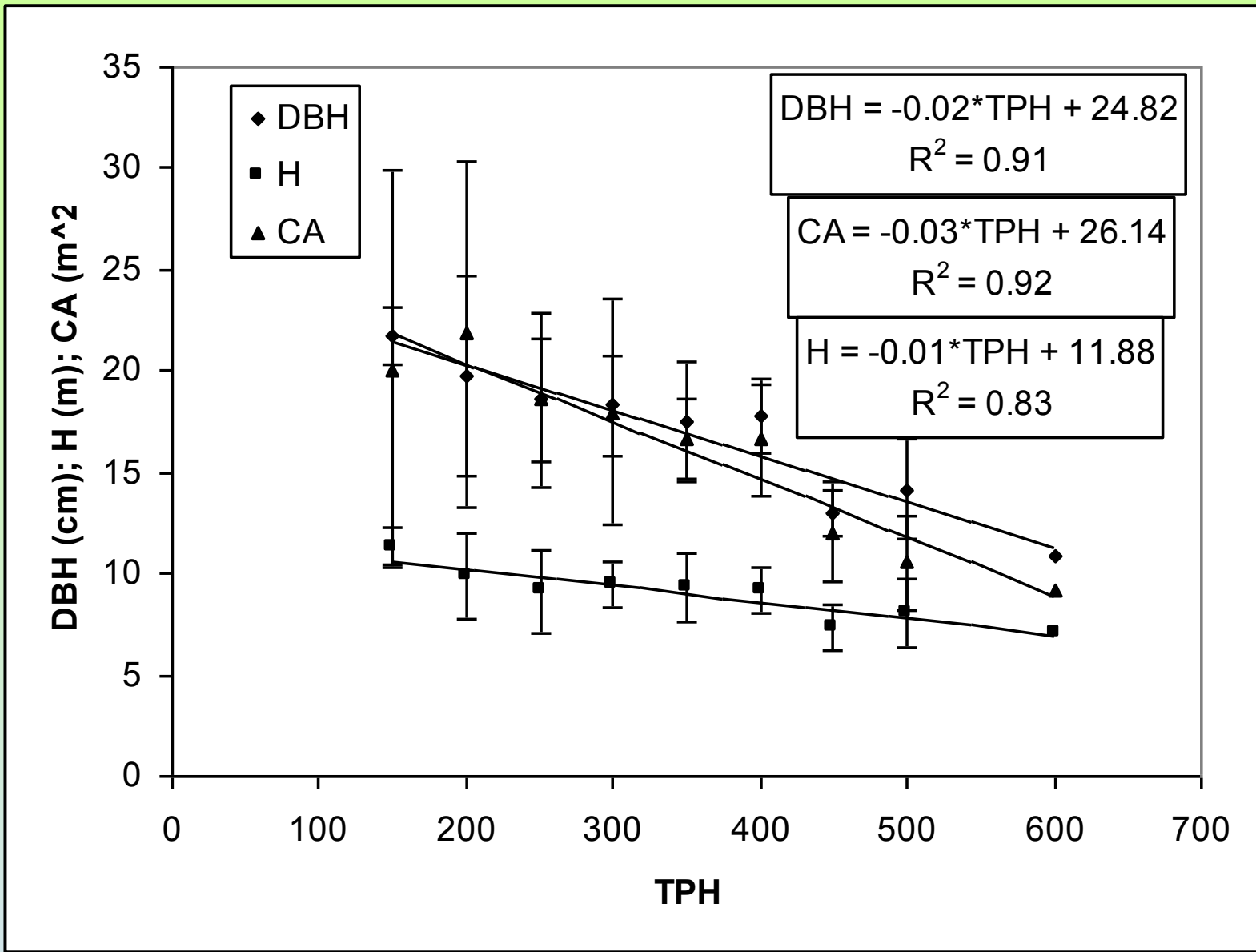
Stand
Density
Index



CC = const.
 TPH₁ ≠ TPH₂ ≠ TPH₃



TPH - high, CC - low



The ability to predict a **number of trees per unit area** will lead to ability to assess forest biometrics (height, basal area etc.).

מרכיבי התוכנית

מערך קרקעי
[80 חלקות]

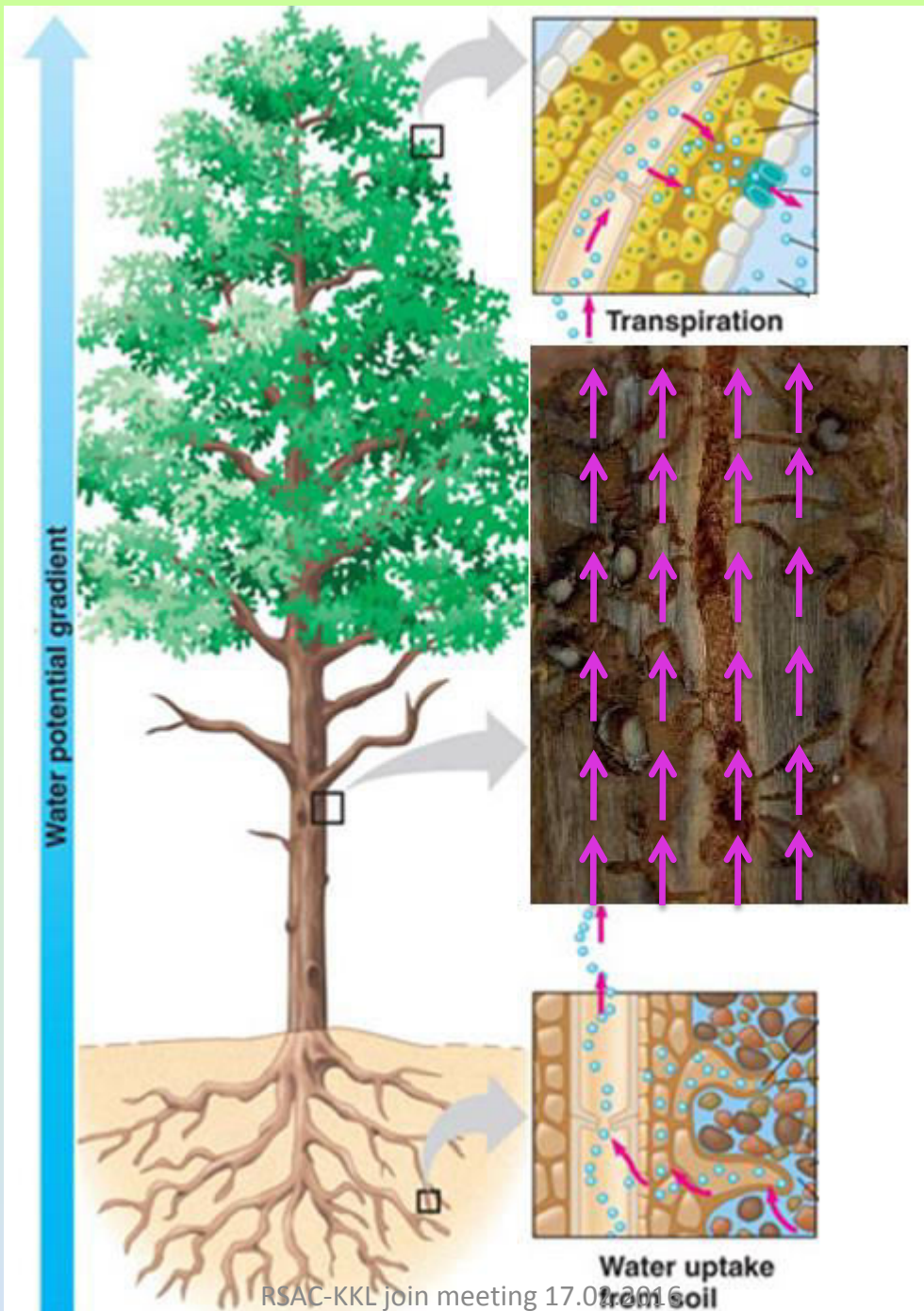
מערך מלא
[230 עומדים]

32 בעומדי
א. ברוטיה

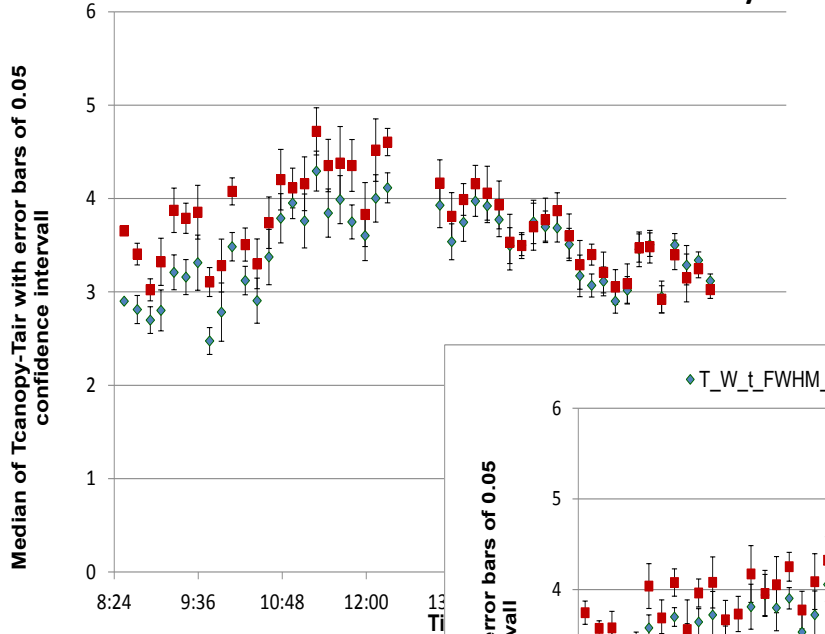
48 בעומדי
א. ירושלים

98 בעומדי
א. ברוטיה

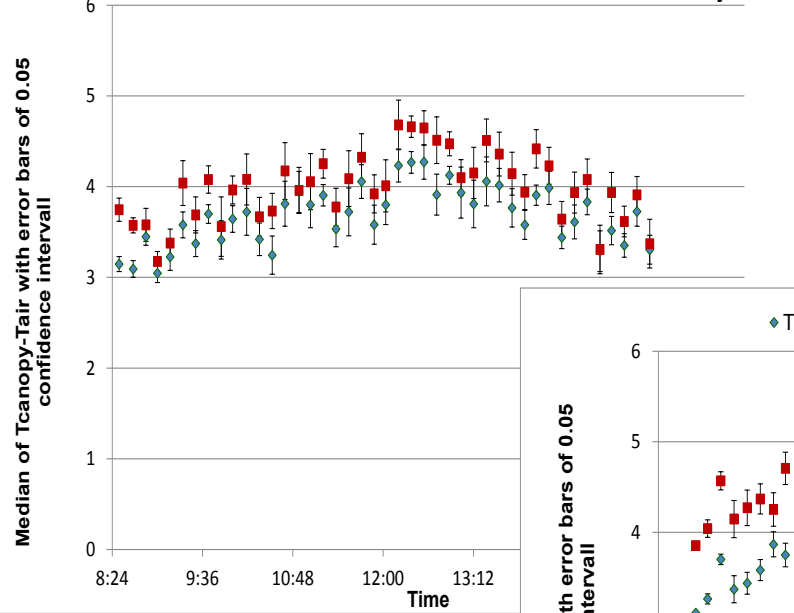
132 בעומדי
א. ירושלים



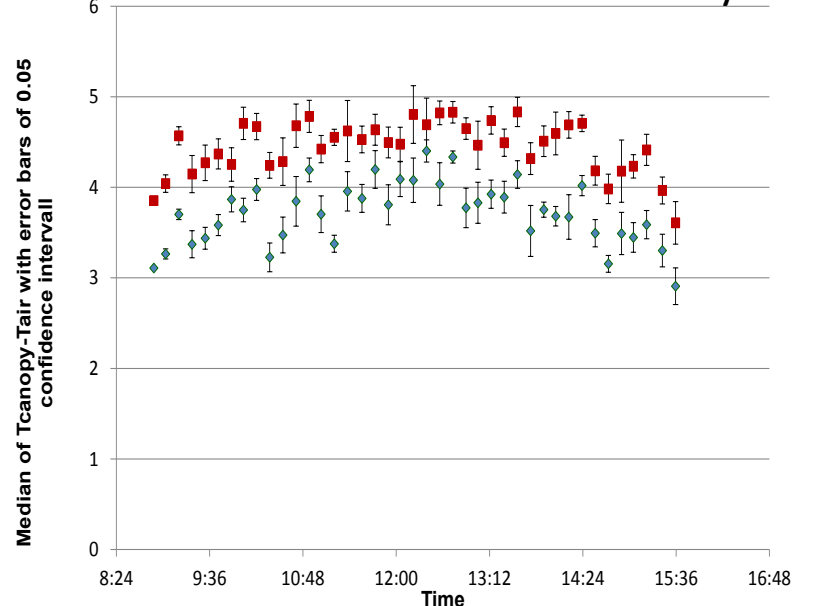
◆ T_W_t_FWHM_med ■ T_D_t_FWHM_med Day 11

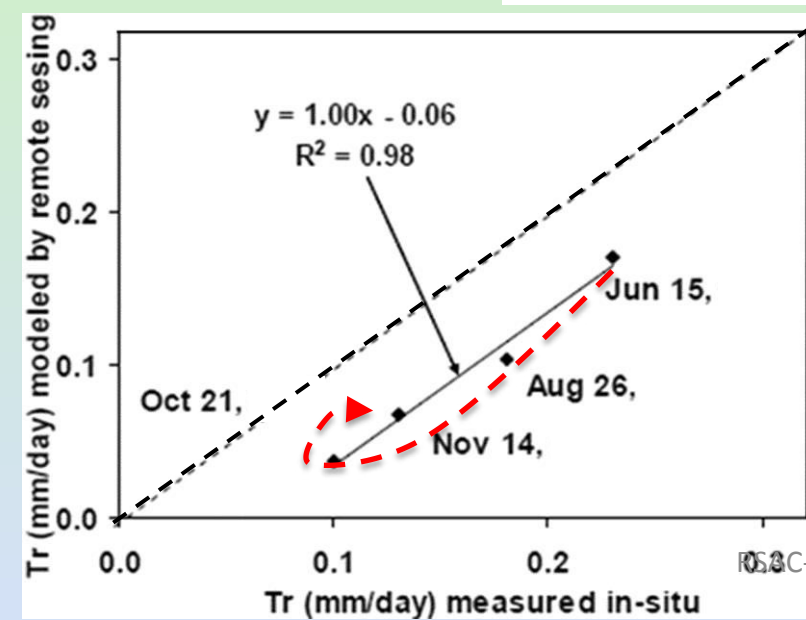
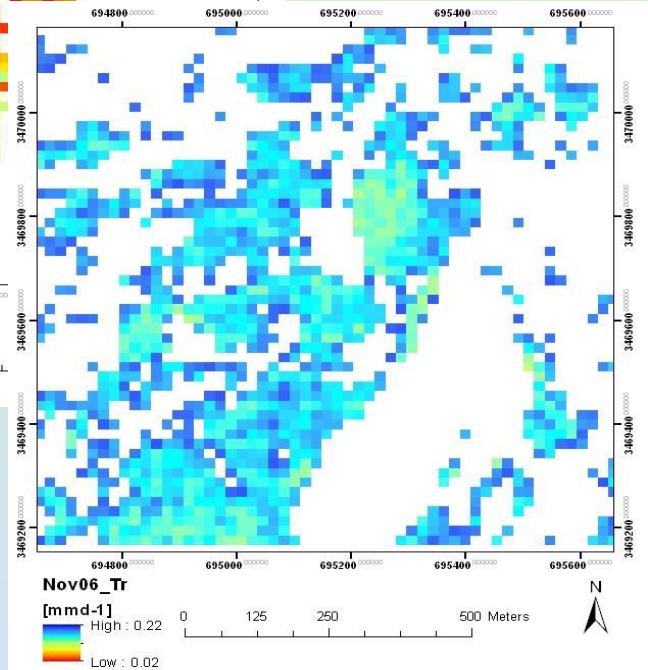
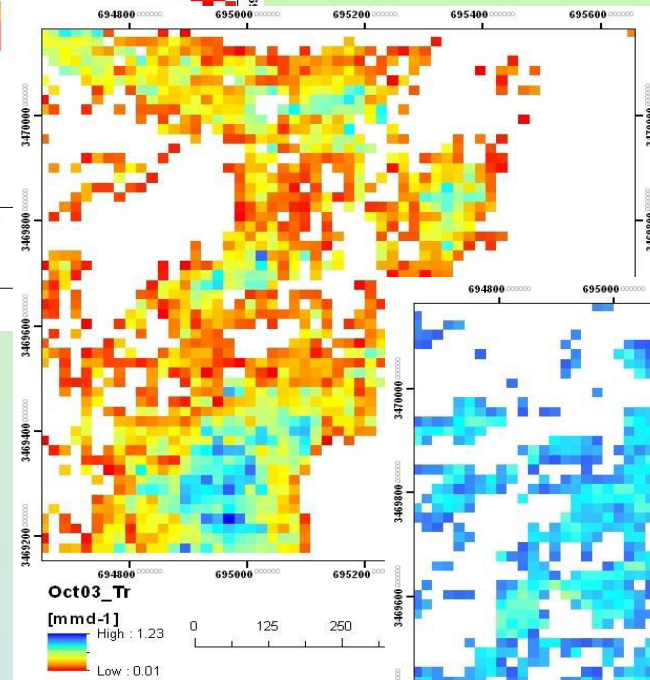
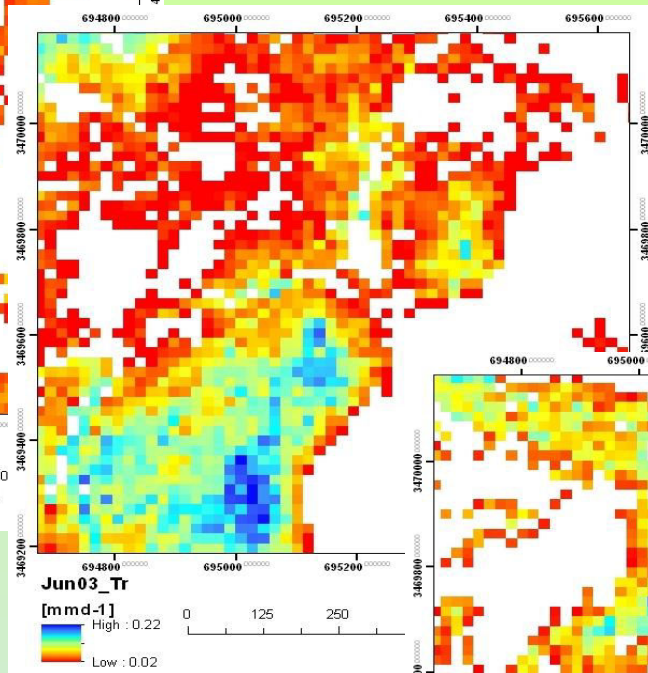
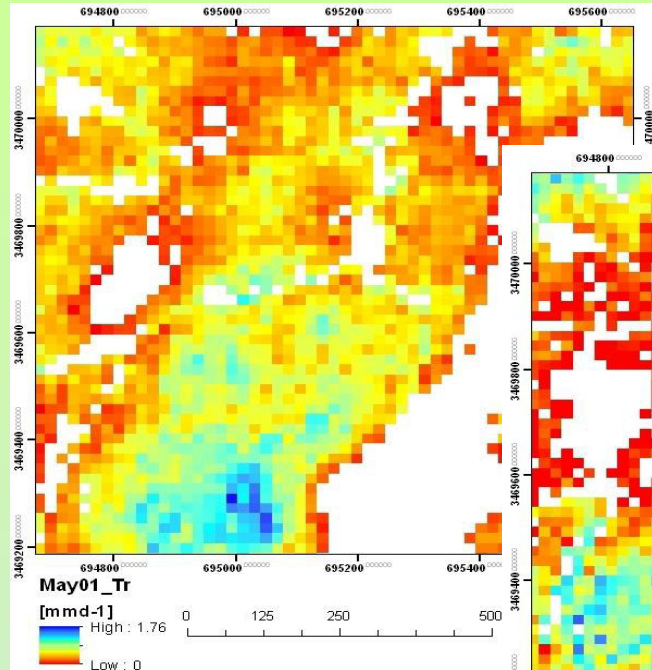


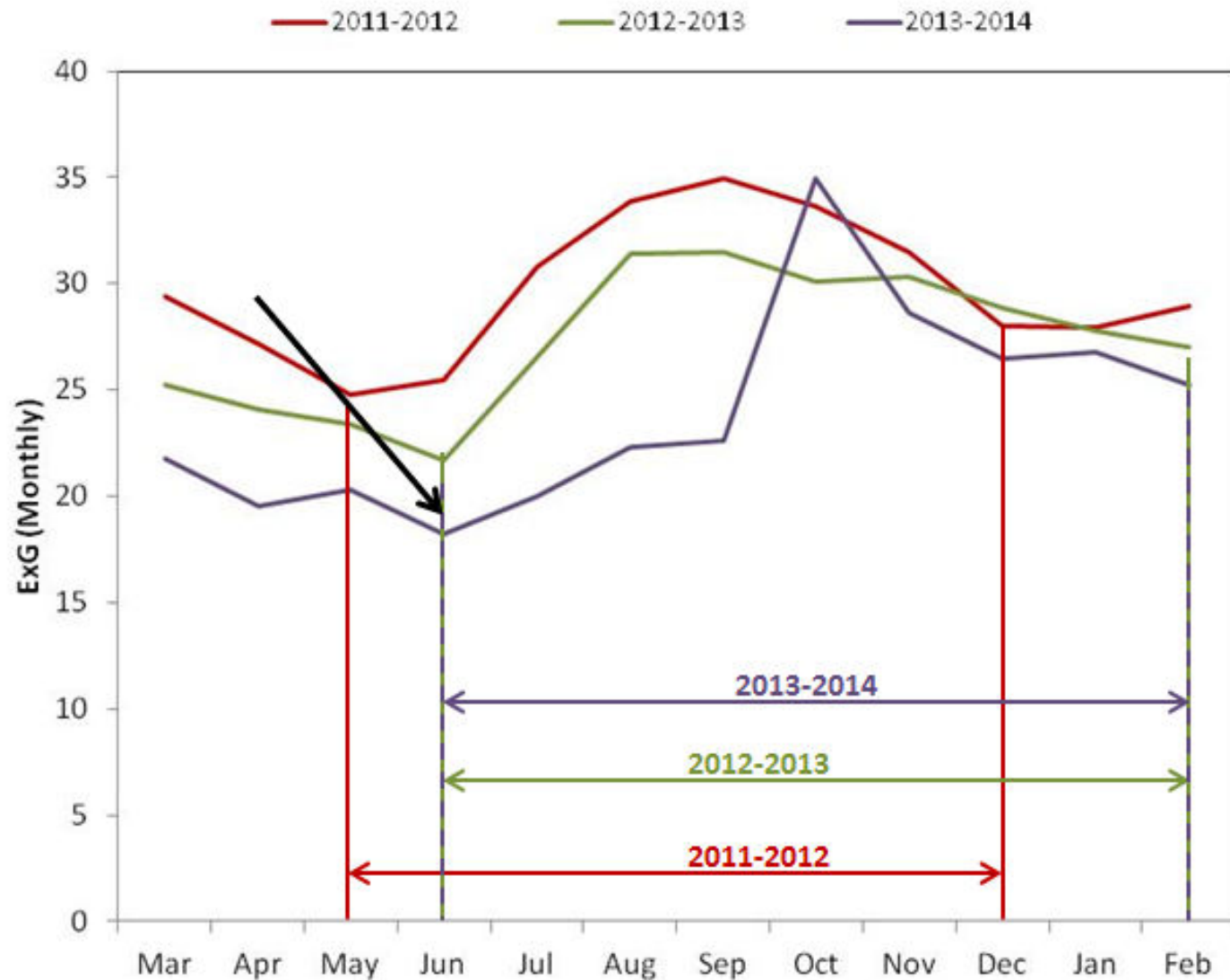
◆ T_W_t_FWHM_med ■ T_D_t_FWHM_med Day 15



◆ T_W_t_FWHM_med ■ T_D_t_FWHM_med Day 18







The length of the period of phenological activity was one month shorter at 2011-2012 as compared to 2012-2013; 2013-2014 seasons

