EFFICIENT  VINEYARD














USDA
NIFA
NATIONAL
GRAPE RESEARCH
ALLIANCE
Boldly,
NY.
www.newyorkwines.org
NATIONAL GRAPE CO-OP
Welch's

Aristotle

384-322 BC

Four Fundamental Causes

Material 	**Form** 
Efficient (Craft – Dynamis) 	**Final (Function – Telos)** 

The Efficient Vineyard Approach

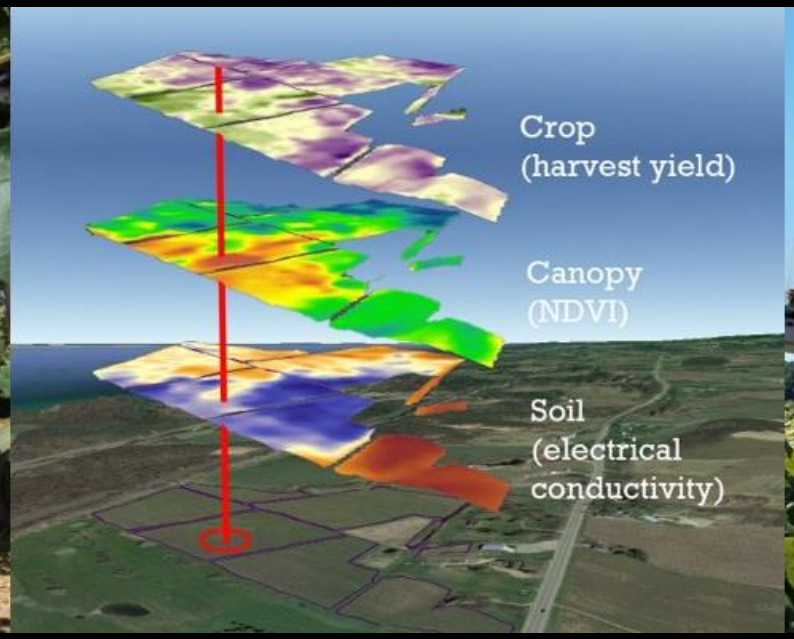
Material (Data)

Measure

Measure vineyard soil, canopy, and crop characteristics using mobile field sensors

Form (Spatial Vineyard Maps)

Model



Model multi-layer spatial data needed for perennial cropping systems

Function (Variable-rate Management)

Manage

Manage vineyards by integrating spatial information with variable-rate technology

Martin Heidegger

Post WWII German Philosopher

"Being and Time"

<u>The Question Concerning Technology</u>

- Technology is not just instruments
- Technology is a mode of revealing truths in nature
- Technology frames the way we view and interact with the natural world
- Technology can be the ultimate danger or saving power…it all depends on the attitude of the user.

Technology is a Process of Revealing Truths in Nature

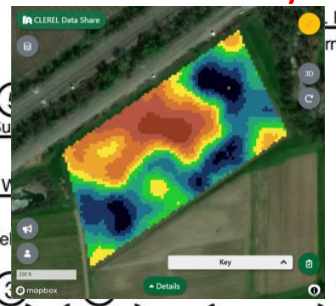
GRAPE PRODUCTIVITY FLOW CHART

FROM NOTES OF NELSON J. SHAULIS APR 1976

POUNDS SOLUBLE SOLIDS HARVESTED PER ACRE

- Production/Acre (rmulas below)
- Variety
- Crop Protection
- Harvesting Efficiency
  - re Training Restriction
  - re Collection
  - re Transport
  - re Detachment
  - re Conveyance

Fruit Quality



Fruit Yield

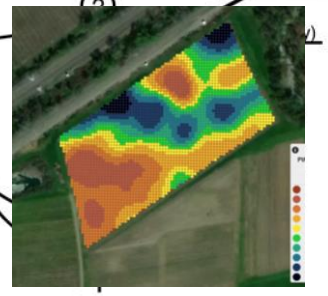
- Grape Crop/Acre
  - ① Ft. of Functioning F
    - Completeness of Trellis Fill
    - Row Spacing
  - ds/Ft. of Row
    - ⑥ Pounds/Foot of Canopy
      - t" Nodes
      - from shoots Arising from "Non-count" Nodes
        - Variety
        - from Basal Nodes
        - as Sprouts
      - ④ Pounds/Node
        - Shoots/Node
          - Pruning Severity
          - Pola
          - Cane Maturation
          - CHO
            - Local
            - Vine Reser
        - Crop/Shoot
          - Weight/Cluster
            - es/Cluster
              - ruit Set
              - Growth Reg.
            - Berry Size
              - CHO
              - Water
              - Growth Reg.
                - Applied GA
                - Seed
                - No. Size
          - Pollination
            - Pollen Quality
              - CHO
                - Production
                - Shoot Elongation Rate
                - Pruning Severity
                - Temperature
                - Growth Retardants
              - B
            - Pollen Source
    - Nodes/Ft. of Canopy
    - ③ Pruning Severity

Yield Components

① (Ft. Row/Acre) ② (Vine Size Ft. Row) (Prun. Sev.) (Crop Wt./Node) = (Crop Wt. of "Count" Nodes/Acre)

⑥ [Crop Wt. of "Count" Nodes/Acre] + ⑤ [Crop Wt. of Base Nodes/Acre] [% S.S. / 100] = Wt. S.S. per Acre

Vine Size



CHO CONSIDERATIONS

- CHO Gradient between Shoots, Canes, & Arms
  - Pe
  - Senes
  - Shade
  - An
  - senes
  - Age
- Net Production of CHO
  - Net Assimilation Rate
    - Chlorophyll
    - Leaf Environment
      - mp.
      - light
    - Leaf Sc
      - Pests
      - Pesti
      - Fung
      - Insec
      - Herb
    - Leaf
      - ion
      - ay)
  - ts
  - ase
  - oots
- CHO Reserves

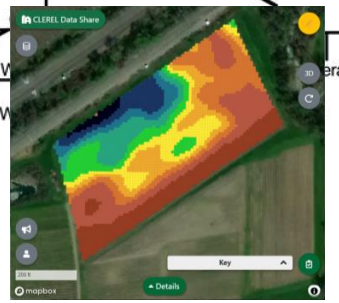
Canopy growth and Light Interception

Leaf Nutrient Status

Roots

- Root No.
  - Root Production
    - CHO
      - Net Product-ion
      - Translo-cation
    - Soil Vol.
  - Root Destruction
    - Ageing
    - Nematodes
    - Mech.
    - Phylloxera
      - Resist. Rootstock
      - Vine Resist.
  - Growth Reg.
- Root Environment
  - N
  - Weeds
  - W
  - eration

Soils and Roots



“I’ve tried to paint technology in both lights which it is reasonably helpful and at the same time it can be misused. It really has more to do with the people behind the technology than the technology itself.

— George Lucas

Variable-Rate Crop Load Management

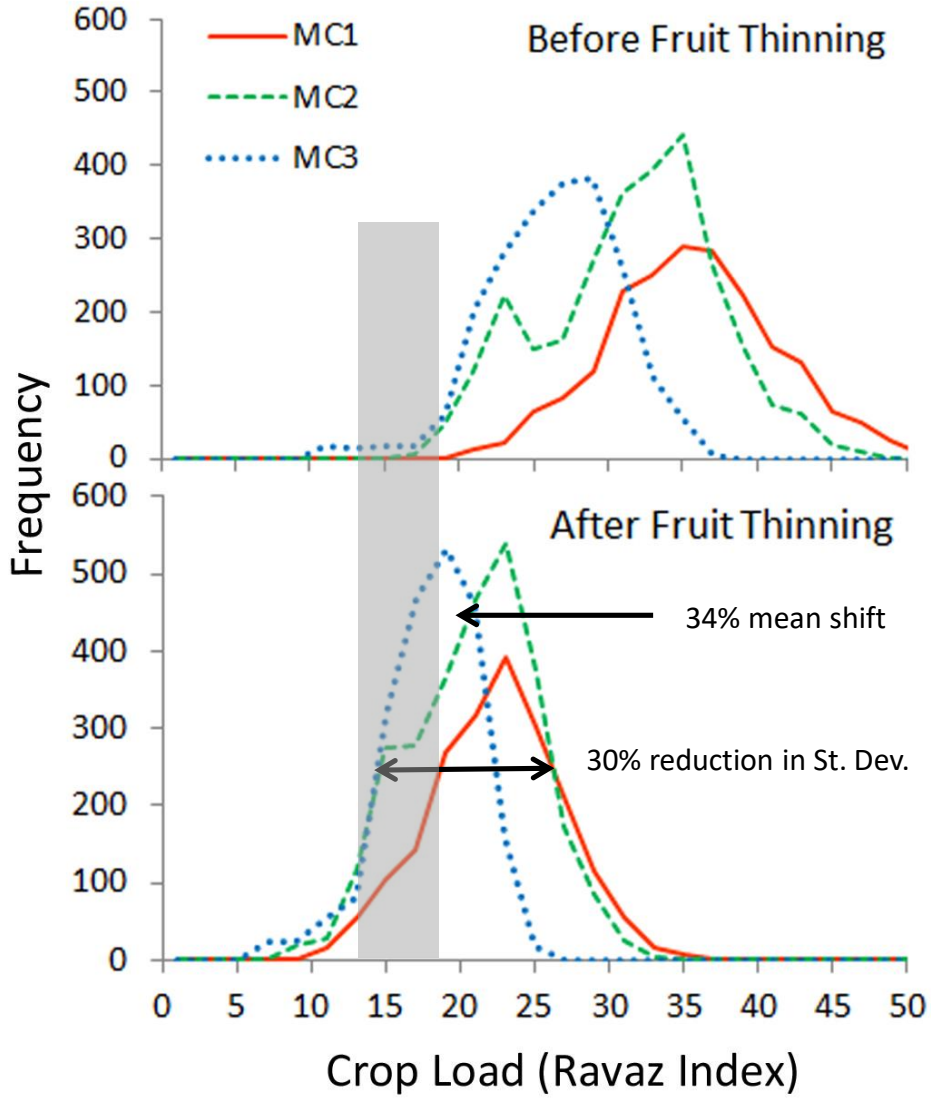
efficient vineyard

Efficient Vineyard Home CLEREL Viticulture Blog myEV Documentation

Variable-rate Fruit Thinning for Concord Crop Load Balance

Jul 16 • Written By Terry Bates

This video describes how we integrate viticulture information, spatial NDVI data, stratified crop estimation, and VR vineyard mechanization technology for variable-rate crop load management in NY Concord vineyards.



Ravaz Index = 30.1
St. Dev. = 6.5

Ravaz Index = 19.8
St. Dev. = 4.6


Ready-to-hand
vs
Present-to-hand

Cornell AgriTech

RIT

Carnegie Mellon University
The Robotics Institute

HiRes Vineyard NUTRITION

efficient vineyard

Ag Leader®

JOHN DEERE OPERATIONS CENTER

Bridge the Technology Valley of Death

Making sense of sensor data

Spatial data processing

In-field validations

Multi-layer data integration

Viticulture decision support

Universities/ Research Institutions

Excellent Science

Commercial Enterprises

Customer Focus

Missing Link

efficient vineyard

MyEV Tool

CLEREL | The Efficient Vineyard Project | Vit Blog

myEV Documentation

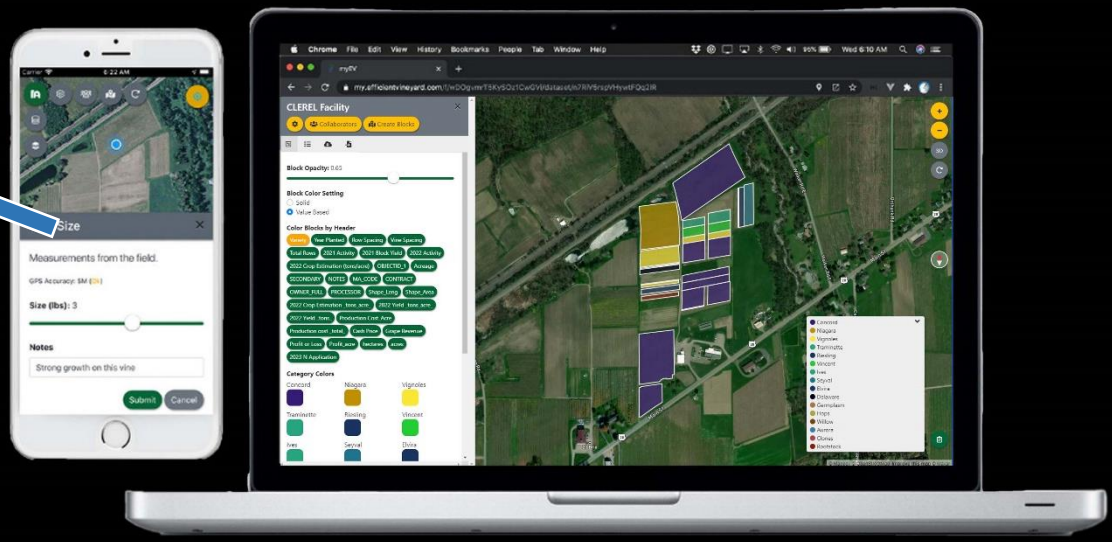
CornellAgriTech New York State Agricultural Experiment Station

Efficient Vineyard

It is not just a project. It is our mission.

Dr. Terry Bates, CLEREL Director (cv)

As a proud member of Cornell AgriTech, our lab



EFFICIENT VINEYARD

Build Your Farm and Invite Your Team

Record Block-level Information

Process Spatial Data

All On-Line

MyEV Tool

Learn More at
www.EfficientVineyard.com

Tools for Working with Spatial Observations

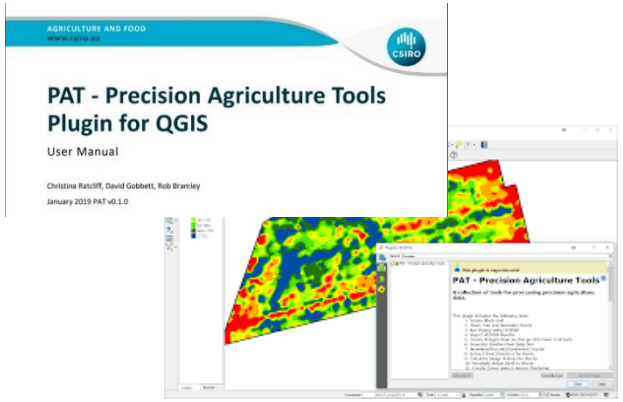
1000

100

10

ArcGIS ESRI

QGIS



Ag Leader® Trimble® JOHN DEERE OPERATIONS CENTER


SMS


Ag Software

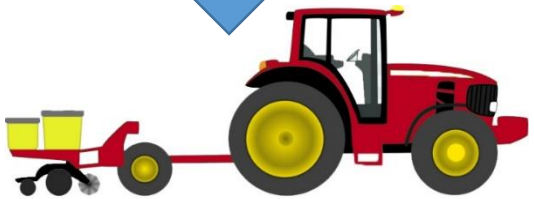

Operations Center


InCommand

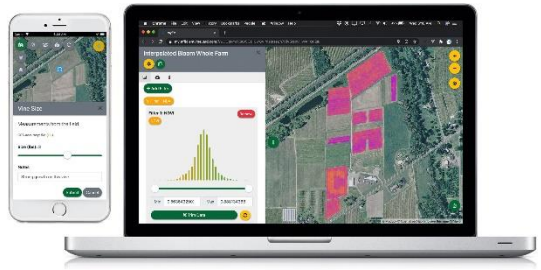

GFX


4640 Display

Rate/Flow Control Mechanism



MyEV Tool



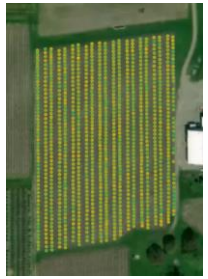
Primary MyEV Function
(Turn spatial vineyard observations into usable management information)

Upload Data

+ New Data Collector

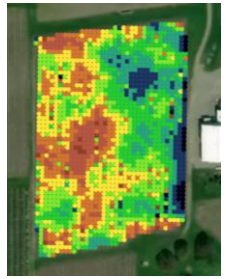
Raw Spatial Data

Filter and Trim



Clean Spatial Data

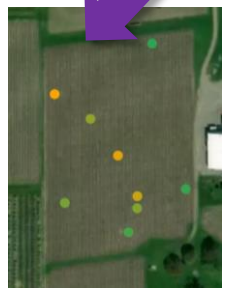
Interpolator



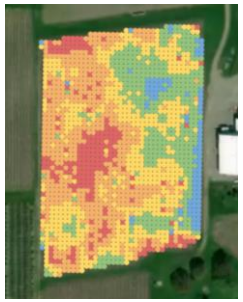
Interpolated Map

Balancing
Simplicity and Flexibility

Grid Generator



Validation Locations



Viticulture Information

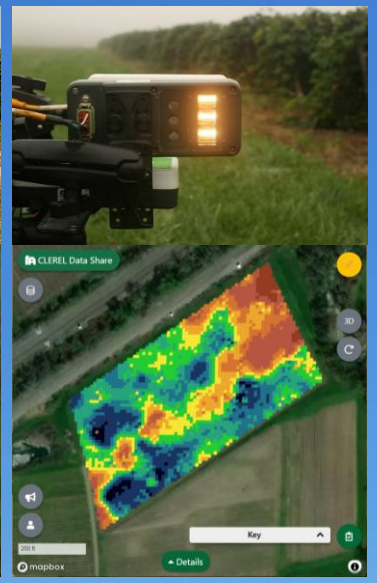
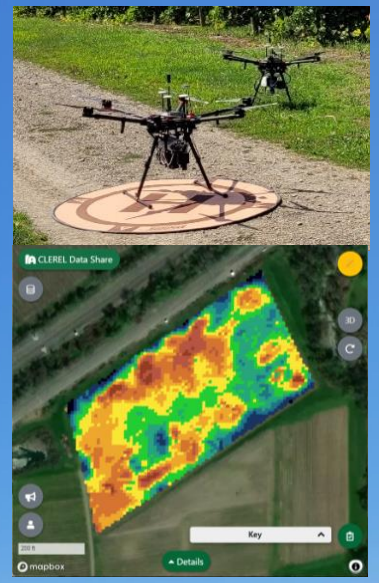
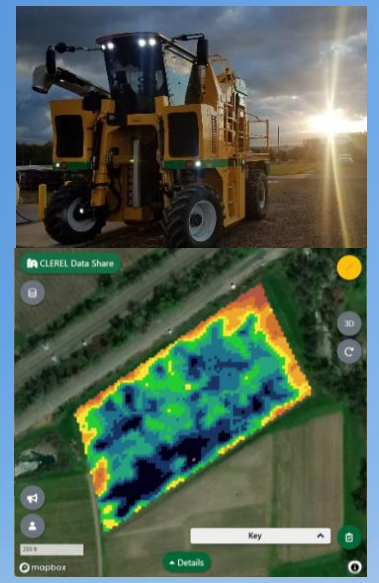
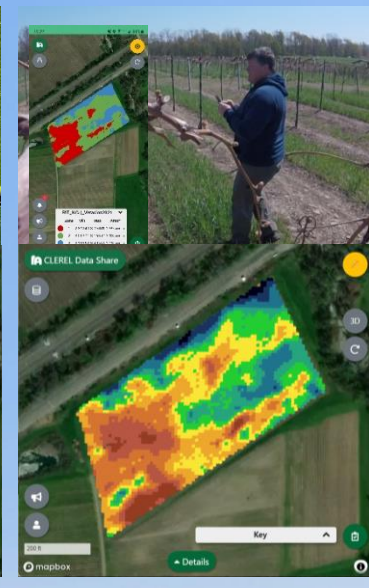
Translator

Download/Export

HiRes Vineyard
NUTRITION

MyEV Training
Nov 28th
10-12 PST

Measure: Collecting and Validating Spatial Observations in the Vineyard

Soil ECa	Canopy Reflectance (NDVI)	Nutrient and Disease Detection	Image Analysis	Yield Monitoring	Fruit Quality	Grower Observations
						

Sensor Validation is Important…

…to translate spatial sensor data into horticultural information


Translator
Bates 2022 Stratified Random Samples Railroad
Samples Dataset Header
2022 Veraison Blade K (%)
Select a header to use for the translation.
Observations
Regression
r = 0.58 y = 0.20x + 0.66
Correlation detected.
Run Translation
mapbox
Walker Rd E
3D
Concord
Niagara
Vignoles
Traminette
Riesling
Vincent
500 ft
mapbox
Main St
tin Block West - All Macros
2021 Veraison Petiole Mg
2021 Veraison Petiole S
2021 Veraison Blade N
2021 Veraison Blade P
2021 Veraison Blade K
2021 Veraison Blade Ca
2021 Veraison Blade Mg
2021 Veraison Blade S
2022 Bloom Petiole N
2022 Bloom Petiole P
2022 Bloom Petiole K
2022 Bloom Petiole Ca
2022 Bloom Petiole Mg
2022 Bloom Petiole S
2022 Bloom Blade N
2022 Bloom Blade P
2022 Bloom Blade K
2022 Bloom Blade Ca
2022 Bloom Blade Mg
2022 Bloom Blade S
2022 Veraison Petiole N
2022 Veraison Petiole P
2022 Veraison Petiole K
2022 Veraison Petiole Ca
2022 Veraison Petiole Mg
2022 Veraison Petiole S
2022 Veraison Blade N
2022 Veraison Blade P
2022 Veraison Blade K
2022 Veraison Blade Ca
Low N
Check
Low K
Low Mg
Datapoints

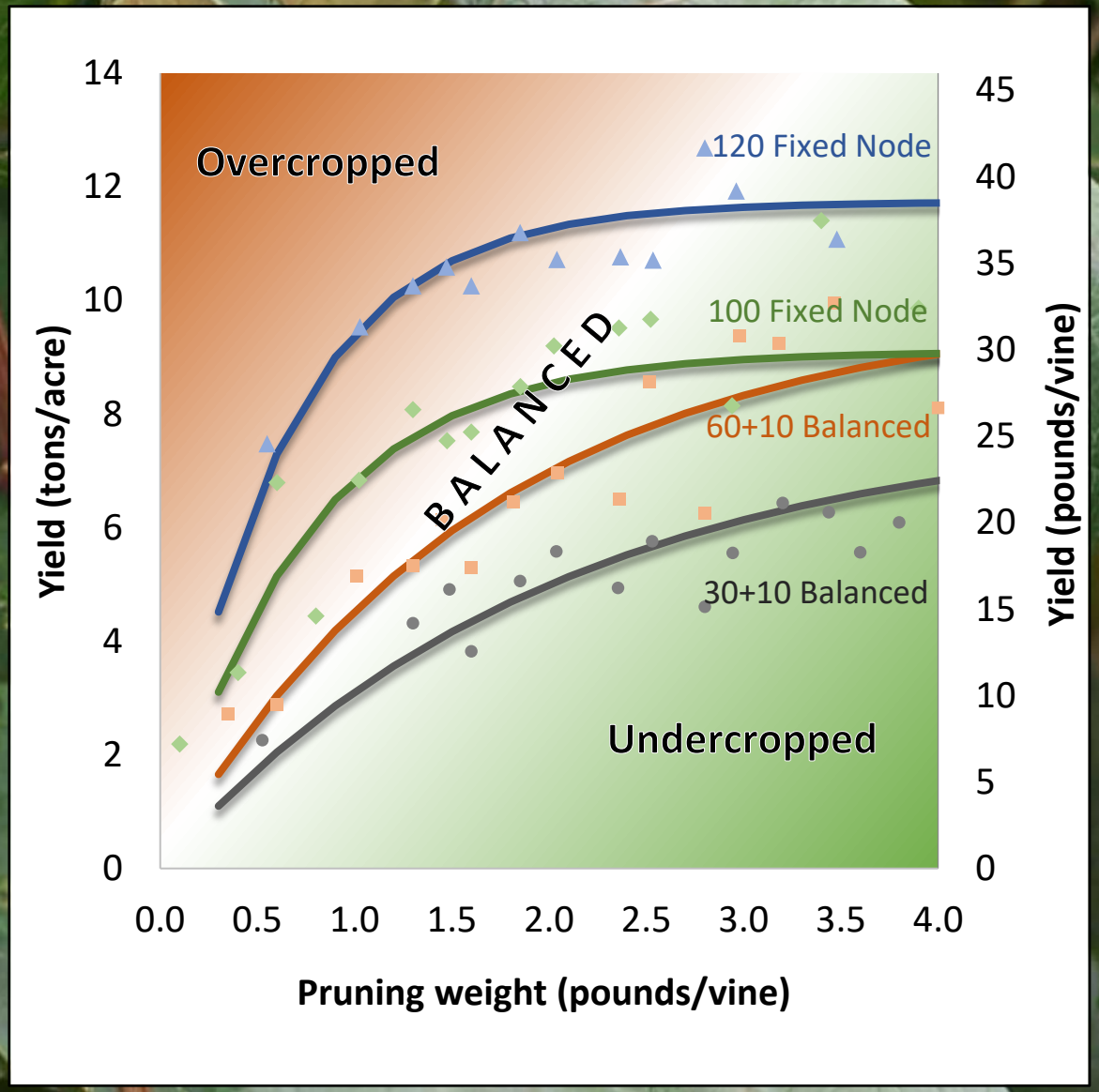
Lake Erie AVA
Concord Crop Load Model

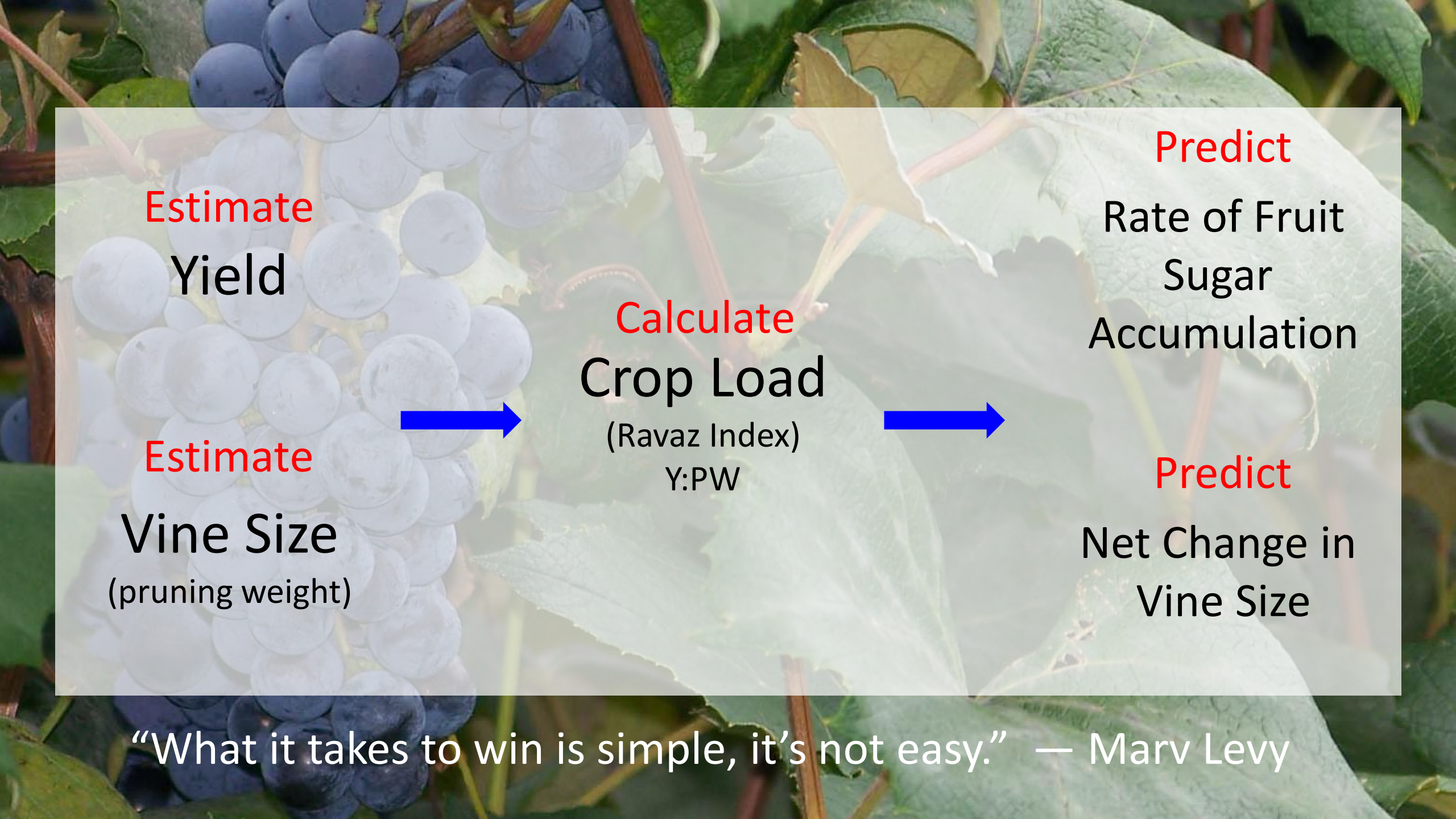
Based Ravaz Index (Y:PW)

Indicator of Vine Balance

Impacts Juice Soluble Solids Accumulation Rate

Impacts Change in Vine Size and Crop Potential for the Next Season



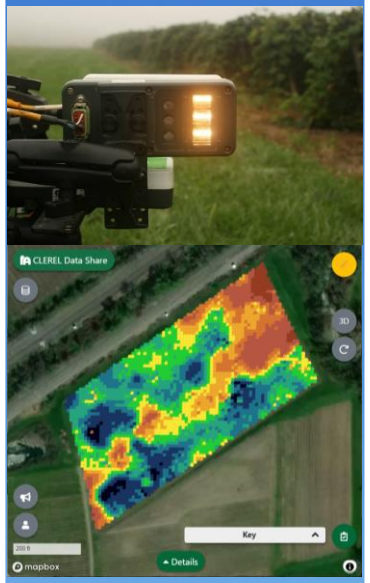


"What it takes to win is simple, it's not easy." — Marv Levy

Measure: Collecting and Validating Spatial Observations in the Vineyard

Soil ECa

Canopy Reflectance (NDVI)



Nutrient and Disease Detection

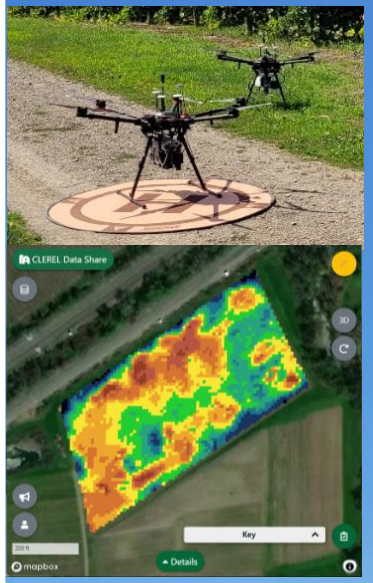
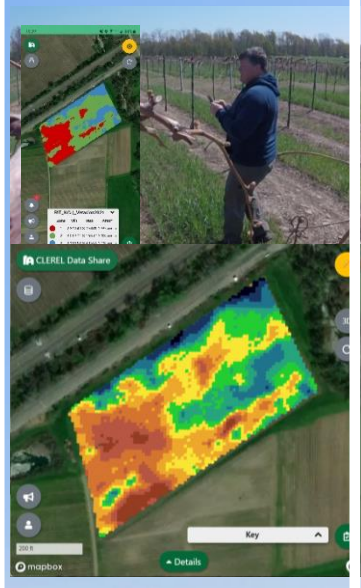


Image Analysis

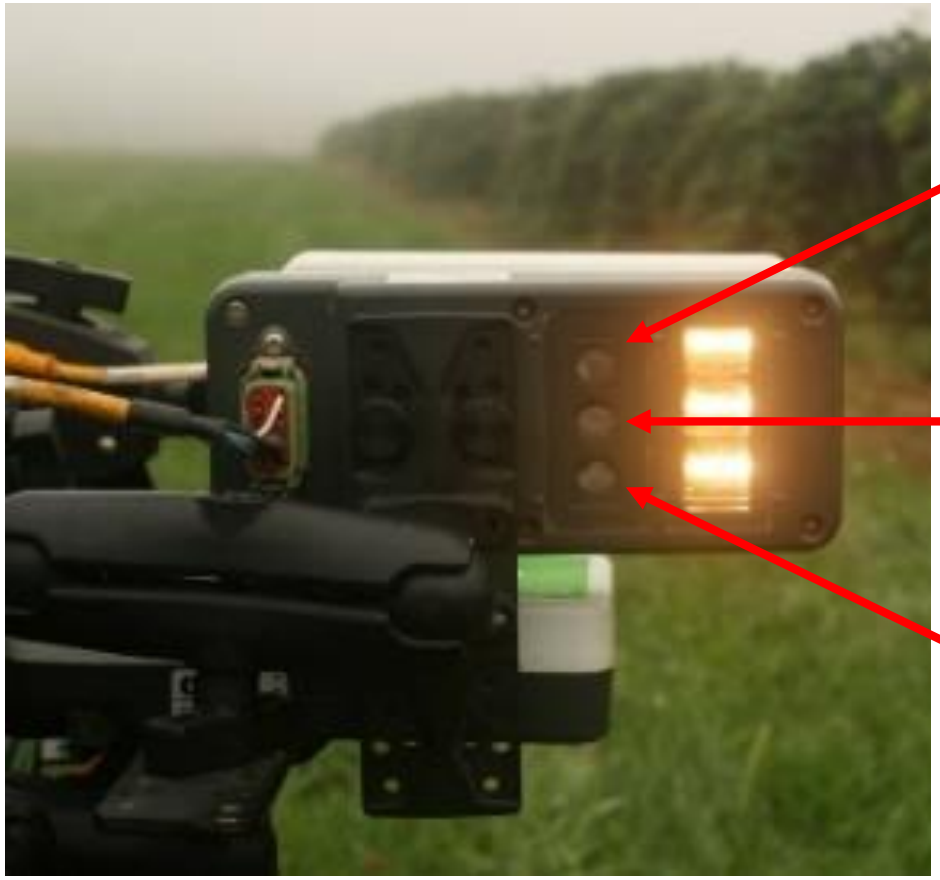
Yield Monitoring

Fruit Quality

Grower Observations



Holland Scientific ACS-430 Reflectance Sensor
GeoScout DataLogger (has internal GPS receiver)
AgLeader 6500 (WAAS Corrected)
(~$5K for a single sensor system with datalogger and internal GPS)



Normalized Difference Vegetative Index (NDVI)

$$\frac{(\text{Near Infra-Red} - \text{Red})}{(\text{Near Infra-Red} + \text{Red})} = (\text{NDVI})$$

Are there healthy leaves in the field of view…or not?

NDVI Values range from 0-1

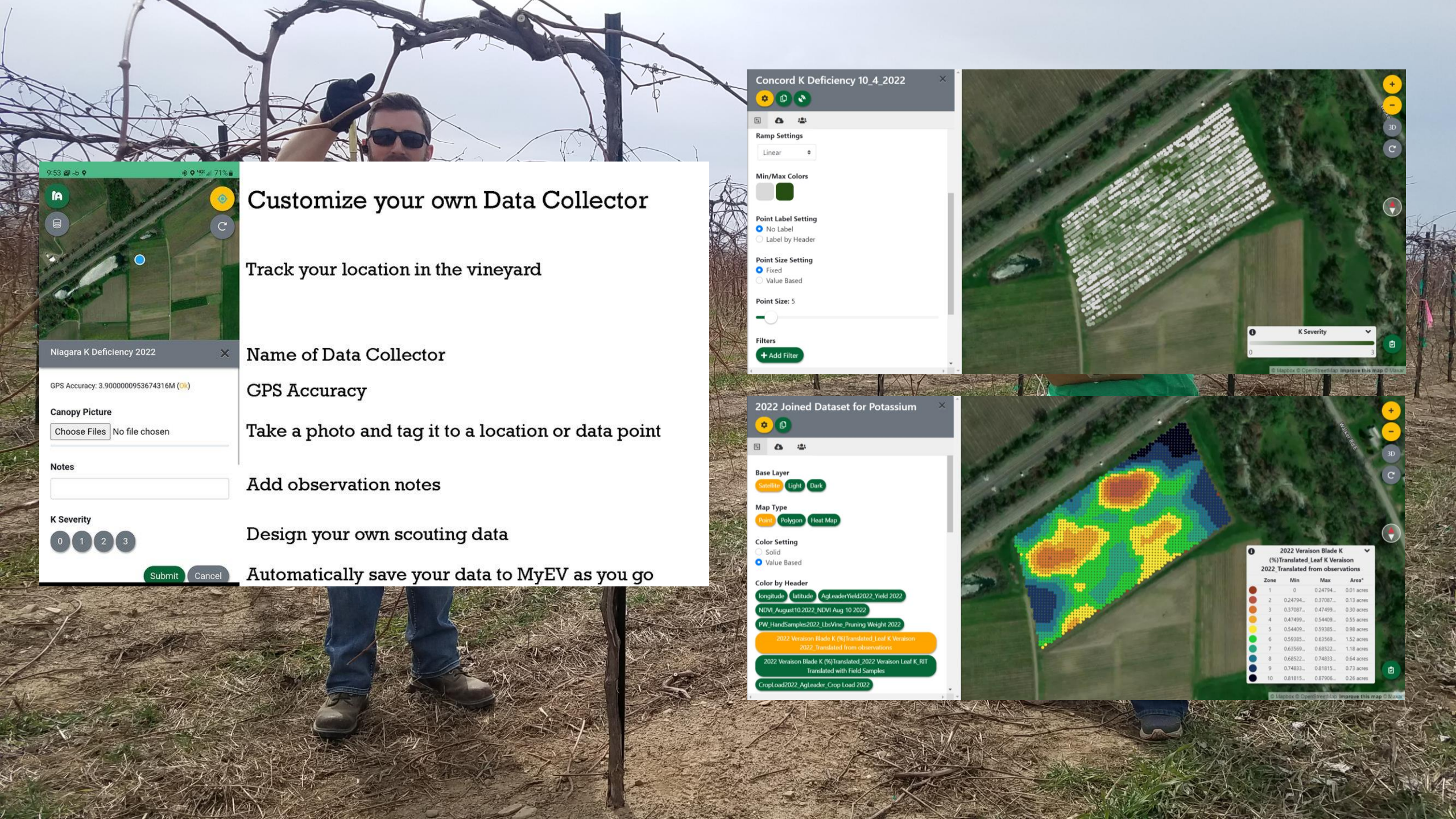
Other VI's can be calculated from raw reflectance data


Crop Circle
Crop Circle
Crop Circle
2 weeks pre-bloom
bloom
2 weeks post-bloom
4 weeks post-bloom

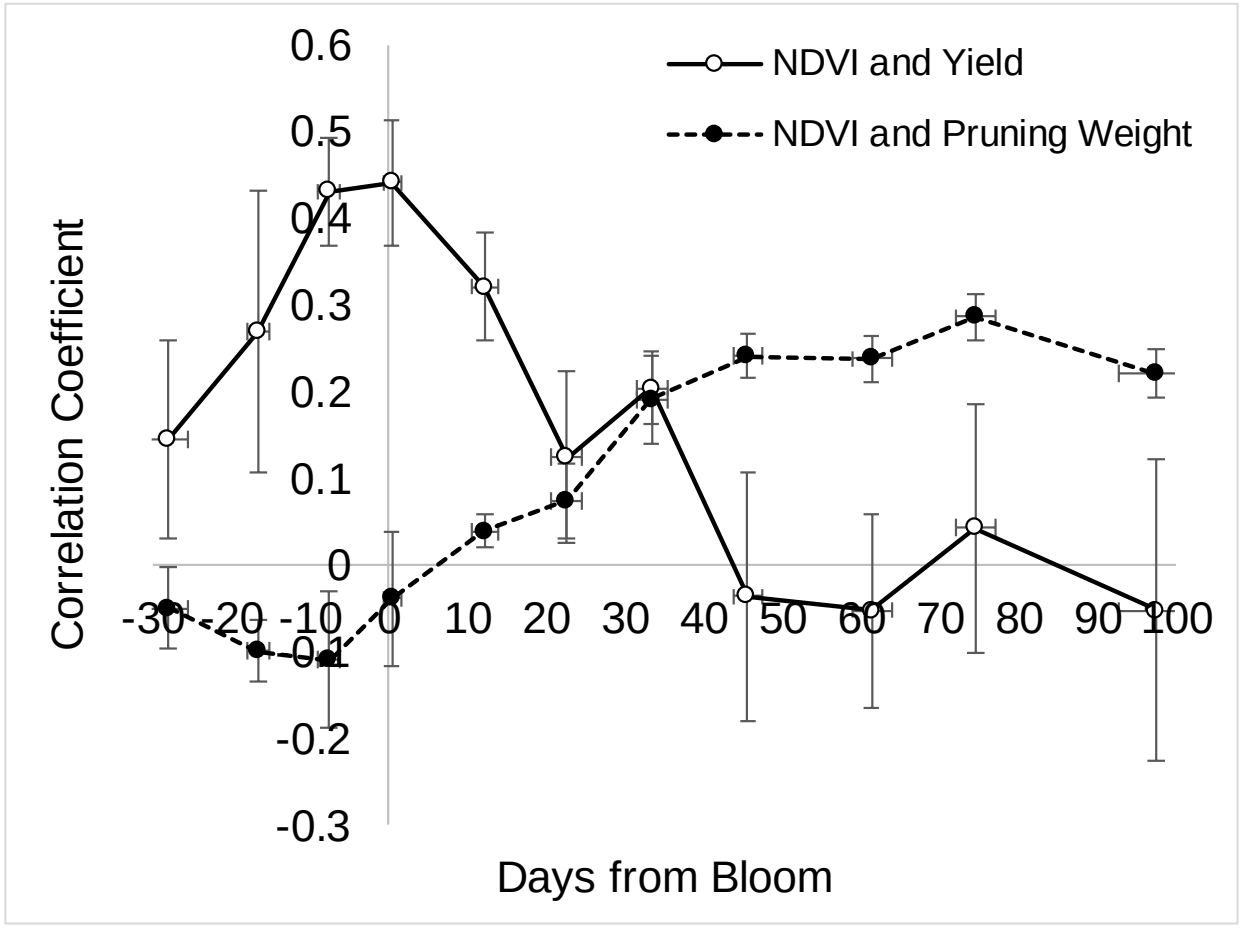
Yield Monitoring

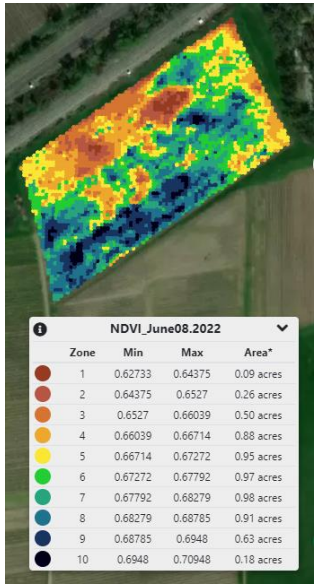
OXBO Yield Tracker, AgLeader 1200 Display, 7500 GPS Receiver

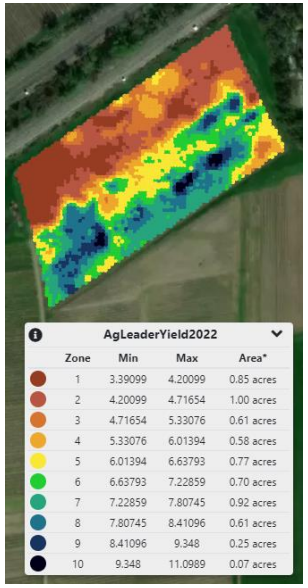
Fruit weight calibrated against scale house weigh tickets

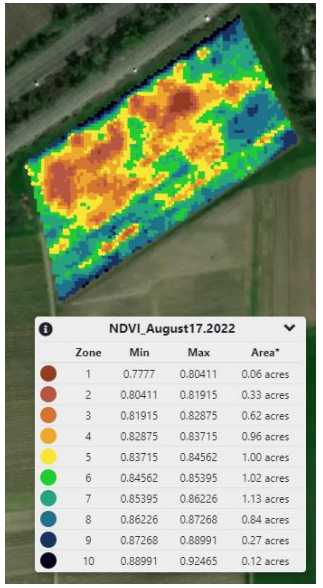

Customize your own Data Collector
Track your location in the vineyard
Name of Data Collector
GPS Accuracy
Take a photo and tag it to a location or data point
Add observation notes
Design your own scouting data
Automatically save your data to MyEV as you go
Niagara K Deficiency 2022
GPS Accuracy: 3.9000000953674316M (Ok)
Canopy Picture
Choose Files
No file chosen
Notes
K Severity
0
1
2
3
Submit
Cancel
Concord K Deficiency 10_4_2022
Ramp Settings
Linear
Min/Max Colors
Point Label Setting
No Label
Label by Header
Point Size Setting
Fixed
Value Based
Point Size: 5
Filters
Add Filter
K Severity
2022 Joined Dataset for Potassium
Base Layer
Satellite
Light
Dark
Map Type
Point
Polygon
Heat Map
Color Setting
Solid
Value Based
Color by Header
longitude
latitude
AgLeaderYield2022_Yield 2022
NDVI_August10.2022_NDVI Aug 10 2022
PW_HandSamples2022_LbsVine_Pruning Weight 2022
2022 Veraison Blade K (%)Translated_Leaf K Veraison 2022_Translated from observations
2022 Veraison Blade K (%)Translated_2022 Veraison Leaf K_RIT Translated with Field Samples
CropLoad2022_AgLeader_Crop Load 2022
2022 Veraison Blade K (%)Translated_Leaf K Veraison 2022_Translated from observations
Zone
Min
Max
Area*

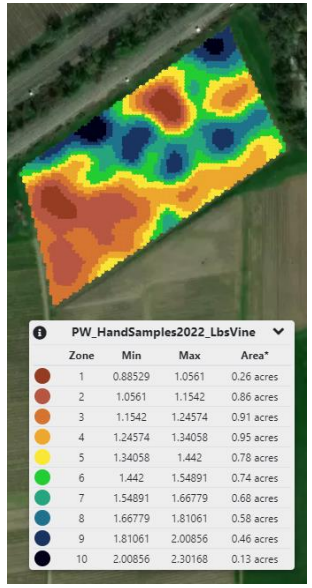
Relating Seasonal Proximal NDVI with Yield and Pruning Weight in NY Concord



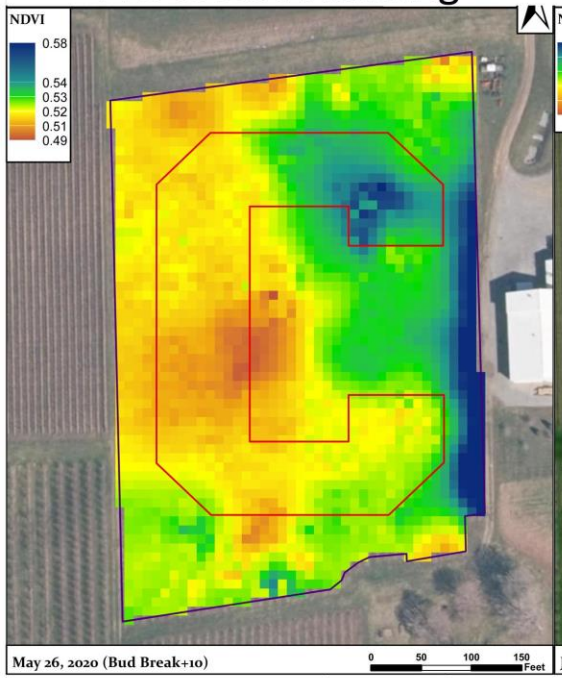






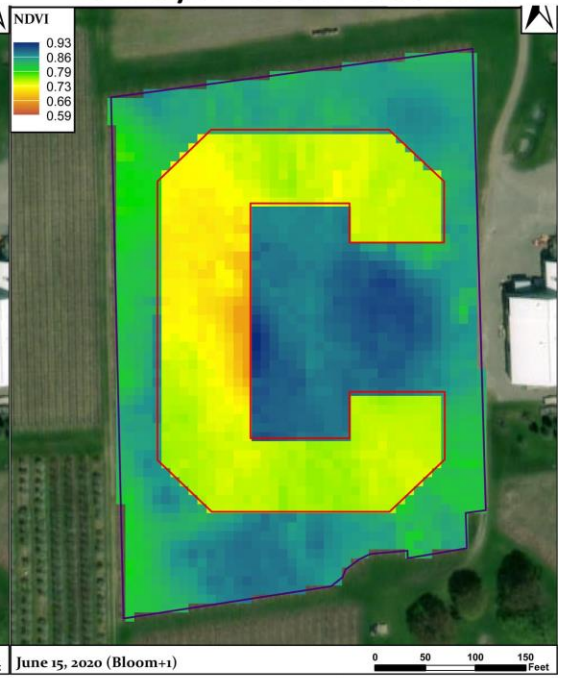


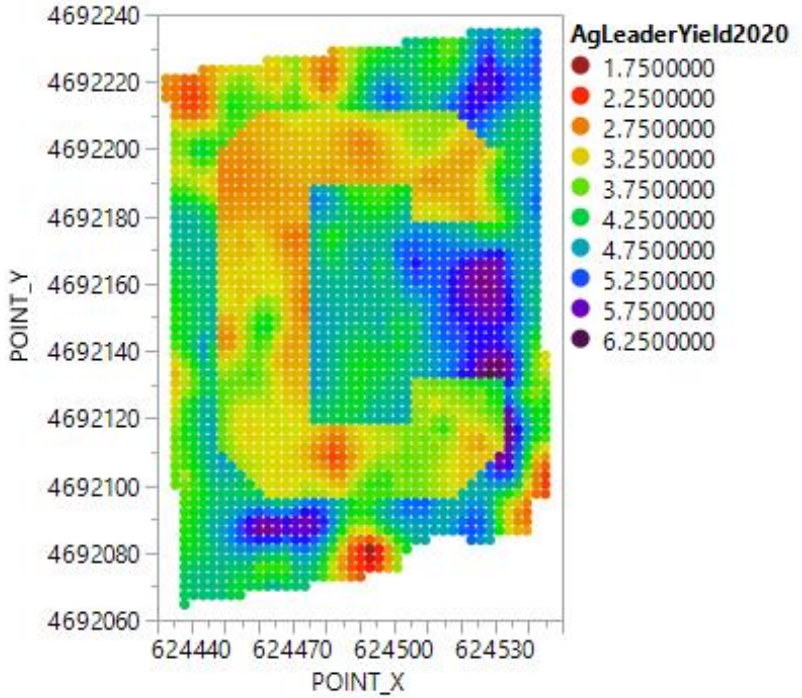
Pre-Shoot Thinning



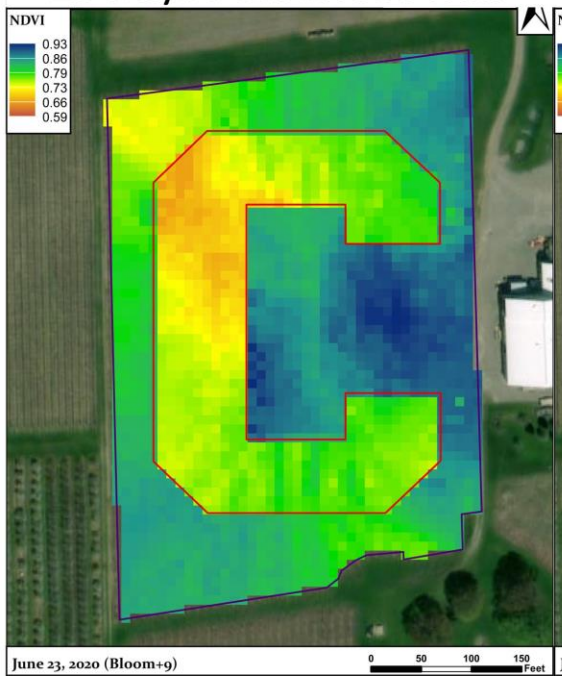
4 Days Post Shoot Thin

18 Days Post Shoot Thin

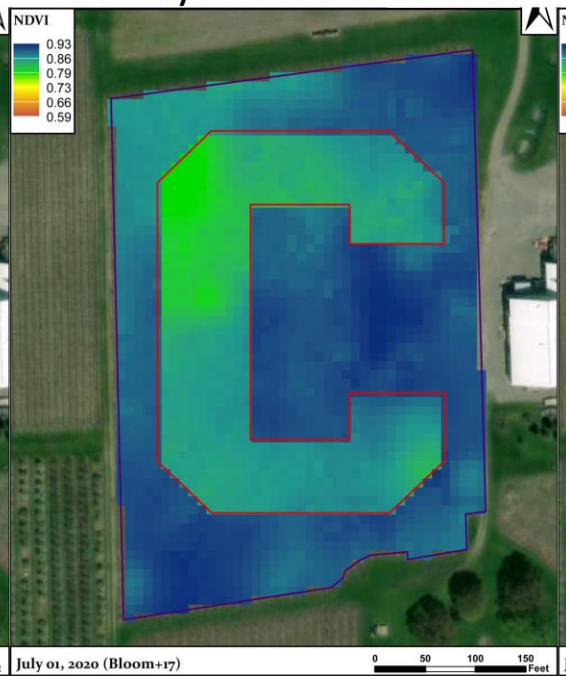




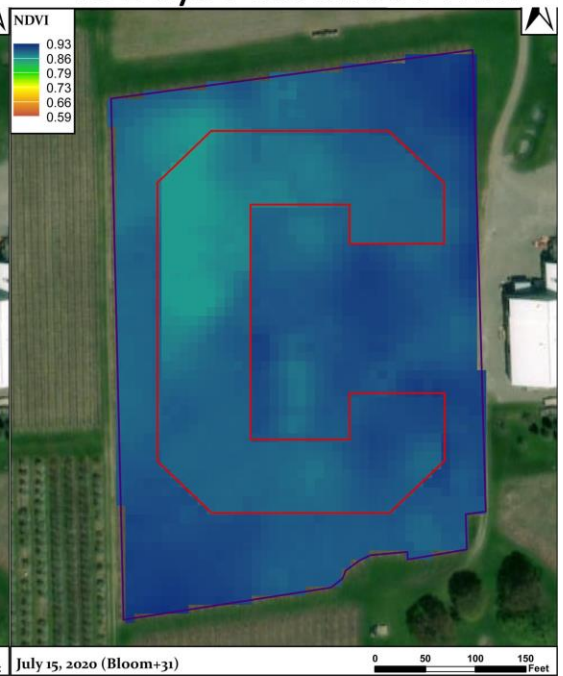
26 Days Post Shoot Thin



34 Days Post Shoot Thin

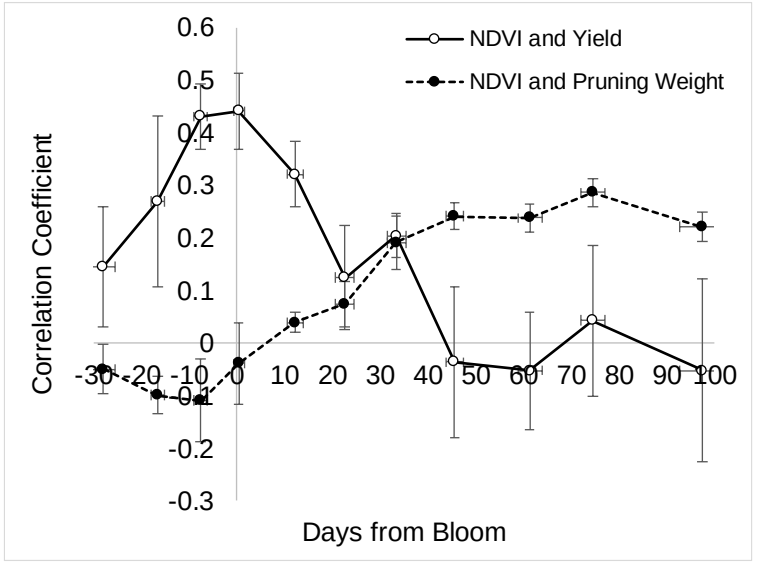


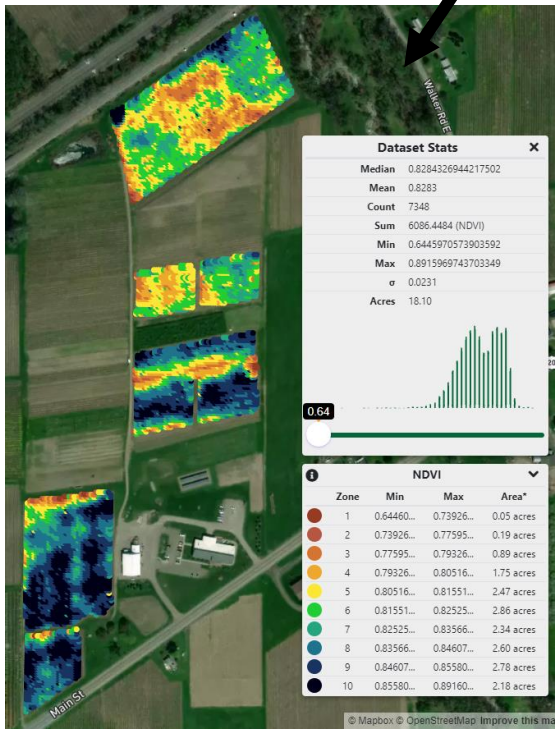
48 Days Post Shoot Thin

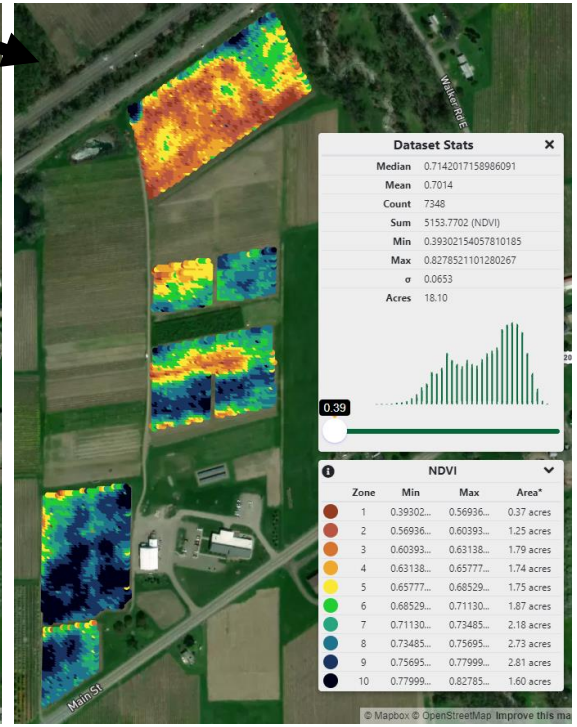


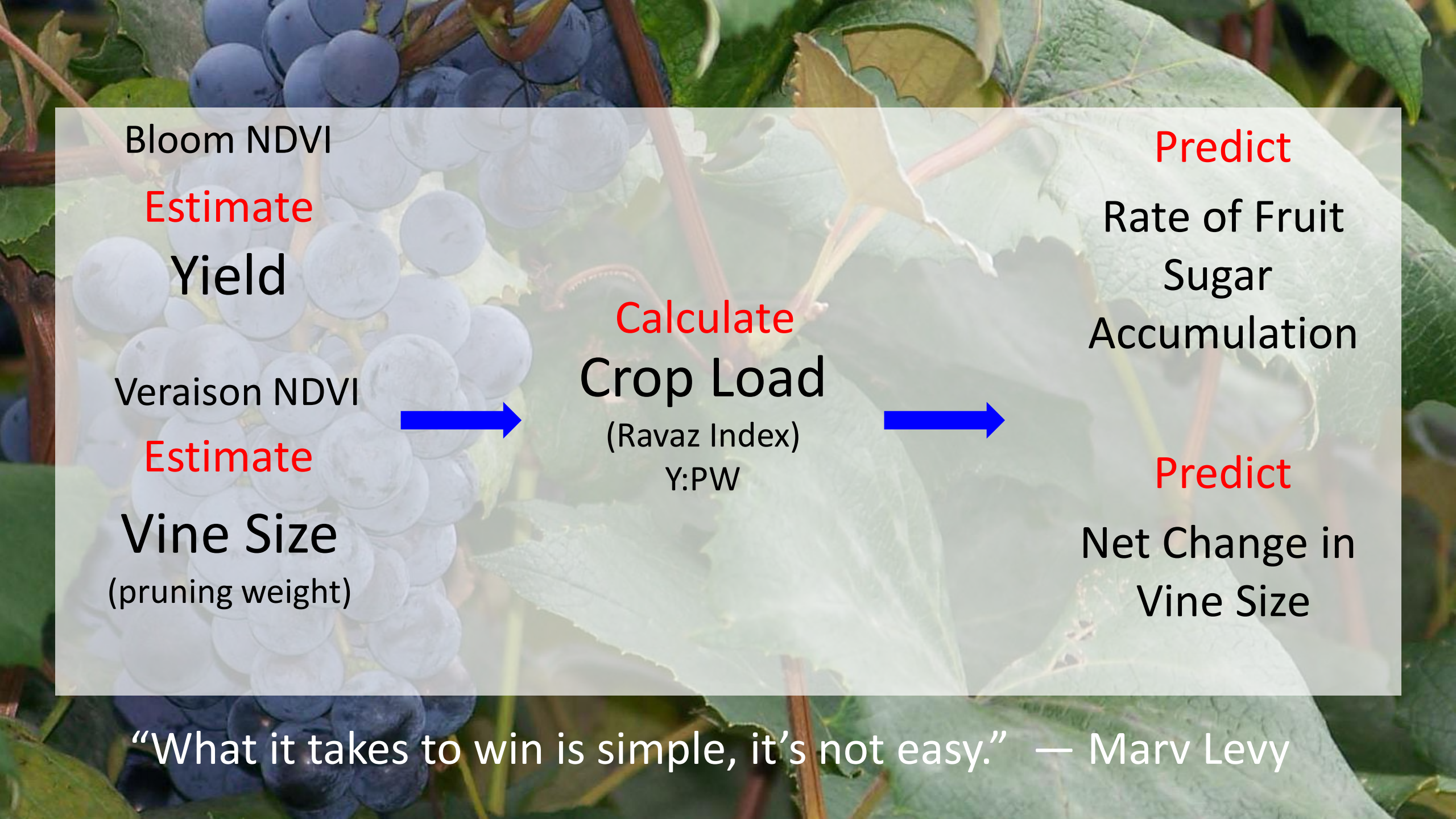
Estimated Vine Size (pounds/vine)

0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0









Bloom NDVI

Estimate

Yield

Veraison NDVI

Estimate

Vine Size

(pruning weight)

Calculate

Crop Load

(Ravaz Index)

Y:PW

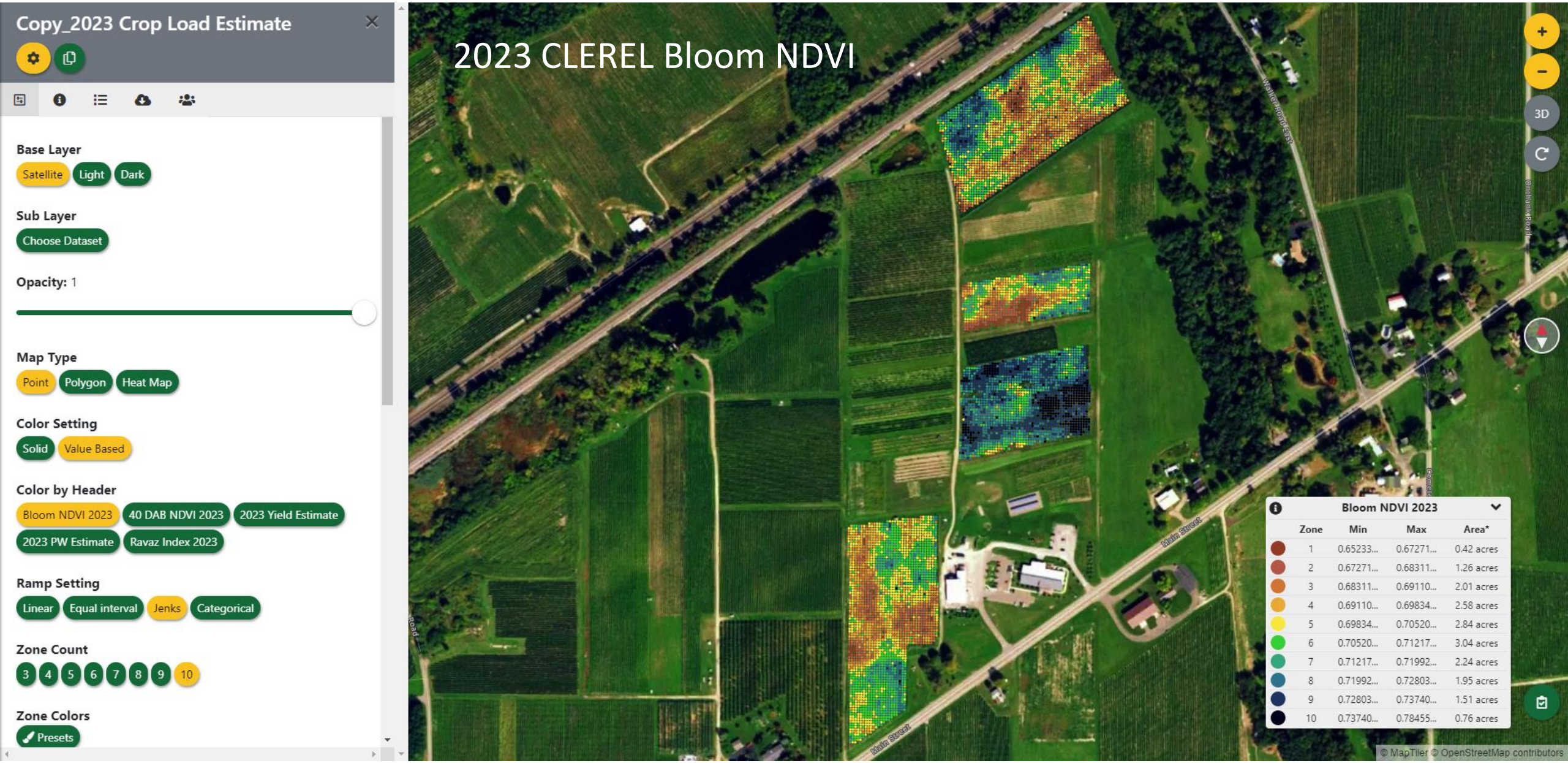
Predict

Rate of Fruit Sugar Accumulation

Predict

Net Change in Vine Size

"What it takes to win is simple, it's not easy." — Marv Levy


Copy_2023 Crop Load Estimate
Base Layer
Satellite
Light
Dark
Sub Layer
Choose Dataset
Opacity: 1
Map Type
Point
Polygon
Heat Map
Color Setting
Solid
Value Based
Color by Header
Bloom NDVI 2023
40 DAB NDVI 2023
2023 Yield Estimate
2023 PW Estimate
Ravaz Index 2023
Ramp Setting
Linear
Equal interval
Jenks
Categorical
Zone Count
3 4 5 6 7 8 9 10
Zone Colors
Presets
2023 CLEREL Bloom NDVI
3D
Bloom NDVI 2023
Zone Min Max Area*
1 0.65233... 0.67271... 0.42 acres
2 0.67271... 0.68311... 1.26 acres
3 0.68311... 0.69110... 2.01 acres
4 0.69110... 0.69834... 2.58 acres
5 0.69834... 0.70520... 2.84 acres
6 0.70520... 0.71217... 3.04 acres
7 0.71217... 0.71992... 2.24 acres
8 0.71992... 0.72803... 1.95 acres
9 0.72803... 0.73740... 1.51 acres
10 0.73740... 0.78455... 0.76 acres
Main Street
Main Street
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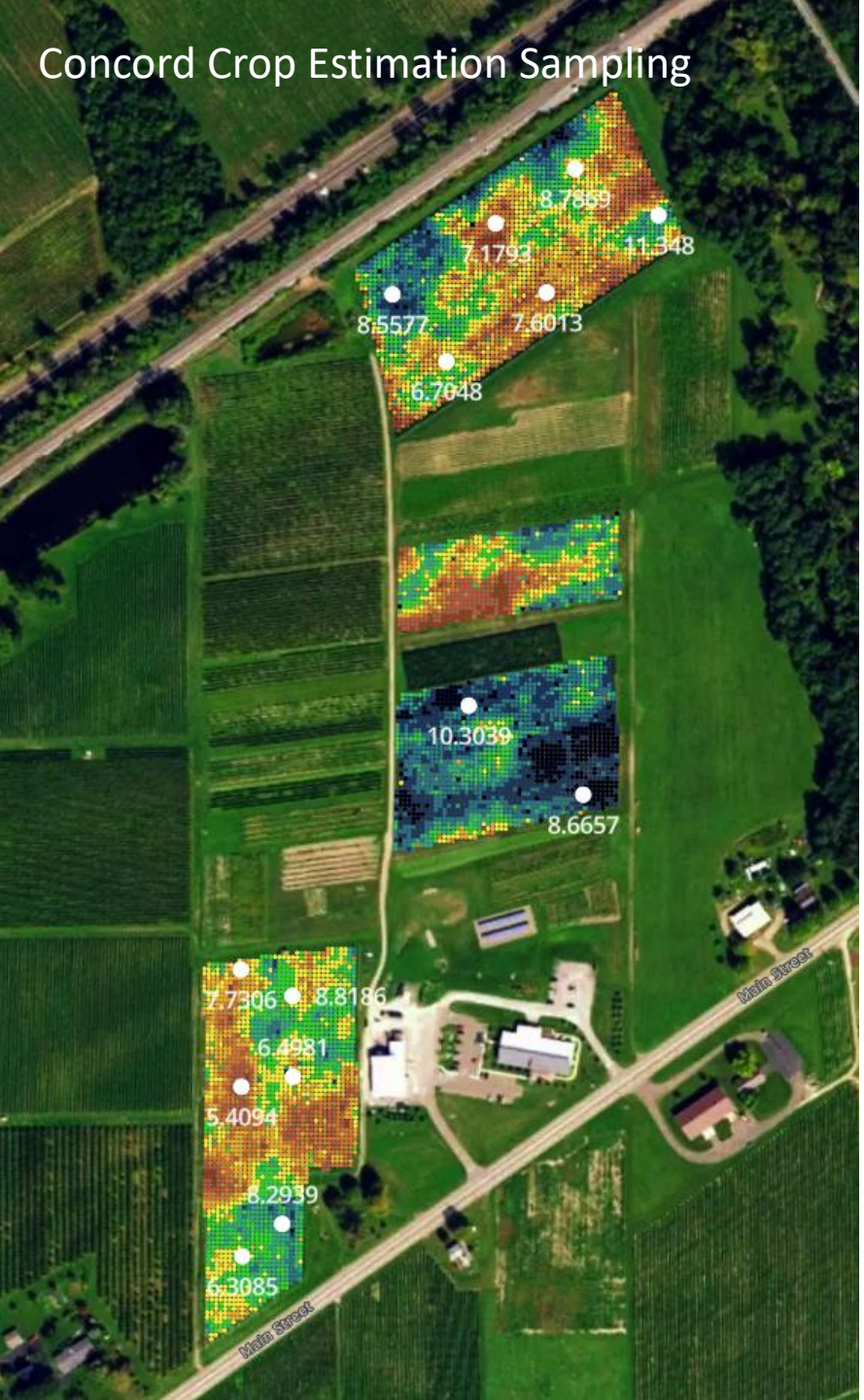
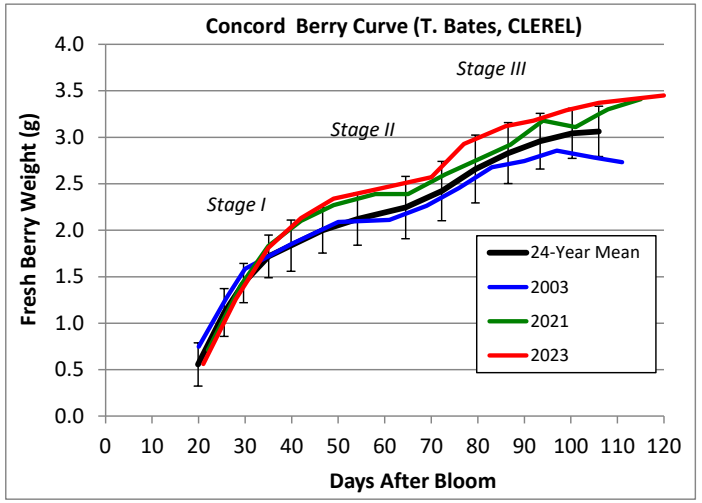


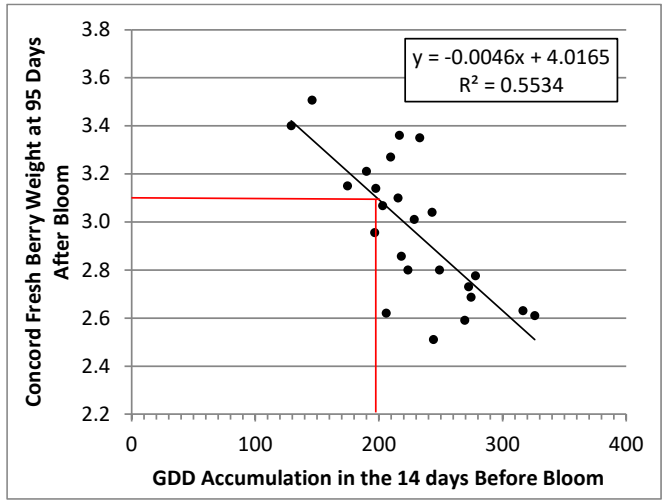
Shoot Count

Cluster Count

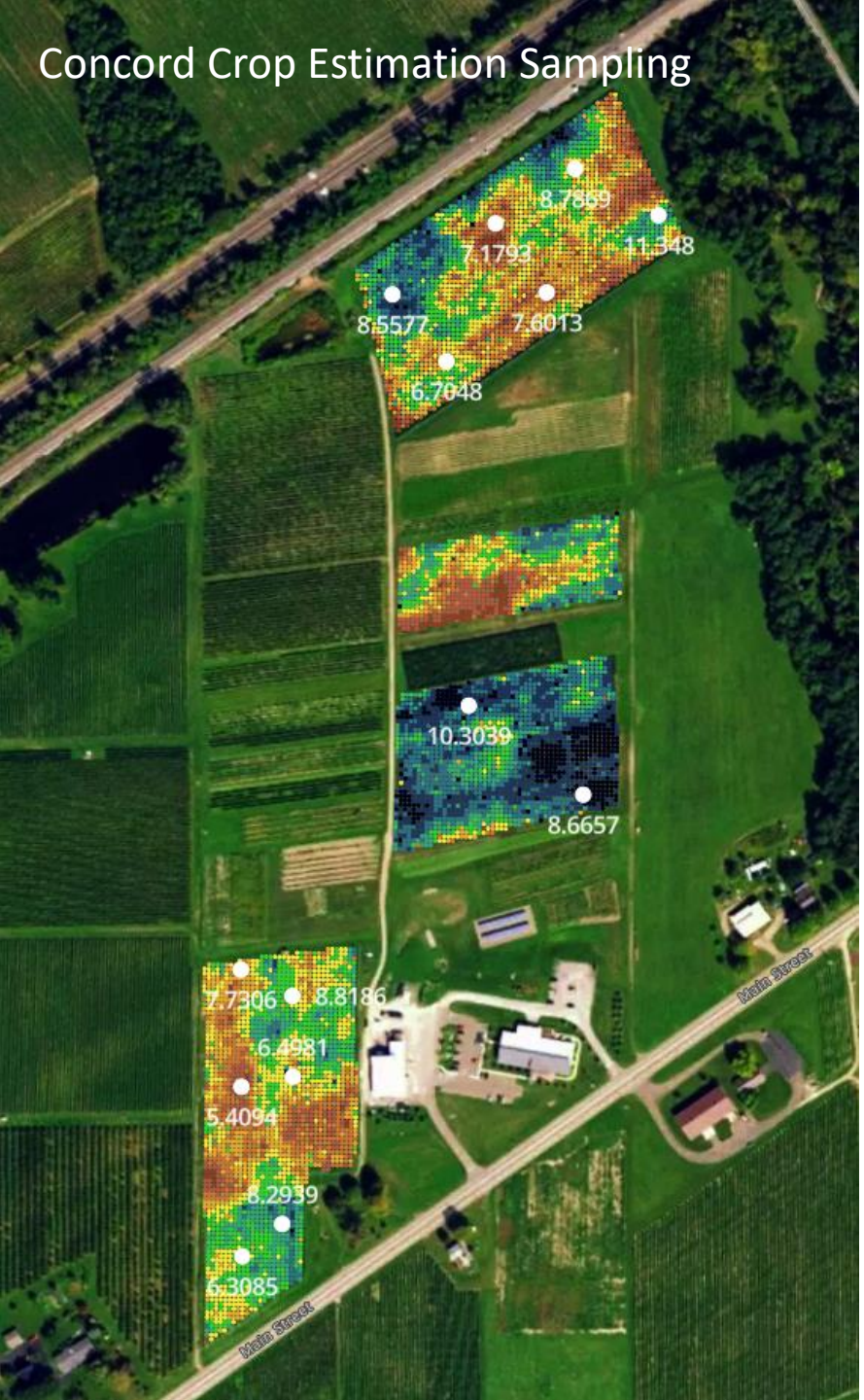
Berry Count

Berry Size





Concord Crop Estimation Sampling



Dr. Terry Bates: Crop Estimation and Thinning Table: 7/16/2003

	Time of Season														
	20DAB			25DAB		30DAB			40DAB	50DAB		Veraison			Harvest
	% of Final Berry Weight														
Pounds of Fruit Removed in 1/100th of an Acre	20	25	30	35	40	45	50	55	60	65	70	75	80	90	100
10	2.5	2.0	1.7	1.4	1.3	1.1	1.0	0.9	0.8	0.8	0.7	0.7	0.6	0.6	0.5
20	5.0	4.0	3.3	2.9	2.5	2.2	2.0	1.8	1.7	1.5	1.4	1.3	1.3	1.1	1.0
30	7.5	6.0	5.0	4.3	3.8	3.3	3.0	2.7	2.5	2.3	2.1	2.0	1.9	1.7	1.5
40	10.0	8.0	6.7	5.7	5.0	4.4	4.0	3.6	3.3	3.1	2.9	2.7	2.5	2.2	2.0
50	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2	3.8	3.6	3.3	3.1	2.8	2.5
60	15.0	12.0	10.0	8.6	7.5	6.7	6.0	5.5	5.0	4.6	4.3	4.0	3.8	3.3	3.0
70	17.5	14.0	11.7	10.0	8.8	7.8	7.0	6.4	5.8	5.4	5.0	4.7	4.4	3.9	3.5
80 →	20.0	16.0	13.3	11.4	10.0	8.9	8.0	7.3	6.7	6.2	5.7	5.3	5.0	4.4	4.0
90	22.5	18.0	15.0	12.9	11.3	10.0	9.0	8.2	7.5	6.9	6.4	6.0	5.6	5.0	4.5
100	25.0	20.0	16.7	14.3	12.5	11.1	10.0	9.1	8.3	7.7	7.1	6.7	6.3	5.6	5.0
110	27.5	22.0	18.3	15.7	13.8	12.2	11.0	10.0	9.2	8.5	7.9	7.3	6.9	6.1	5.5
120	30.0	24.0	20.0	17.1	15.0	13.3	12.0	10.9	10.0	9.2	8.6	8.0	7.5	6.7	6.0
130	32.5	26.0	21.7	18.6	16.3	14.4	13.0	11.8	10.8	10.0	9.3	8.7	8.1	7.2	6.5
140	35.0	28.0	23.3	20.0	17.5	15.6	14.0	12.7	11.7	10.8	10.0	9.3	8.8	7.8	7.0
150	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5	11.5	10.7	10.0	9.4	8.3	7.5
160	40.0	32.0	26.7	22.9	20.0	17.8	16.0	14.5	13.3	12.3	11.4	10.7	10.0	8.9	8.0
170	42.5	34.0	28.3	24.3	21.3	18.9	17.0	15.5	14.2	13.1	12.1	11.3	10.6	9.4	8.5
180	45.0	36.0	30.0	25.7	22.5	20.0	18.0	16.4	15.0	13.8	12.9	12.0	11.3	10.0	9.0
190	47.5	38.0	31.7	27.1	23.8	21.1	19.0	17.3	15.8	14.6	13.6	12.7	11.9	10.6	9.5
200	50.0	40.0	33.3	28.6	25.0	22.2	20.0	18.2	16.7	15.4	14.3	13.3	12.5	11.1	10.0

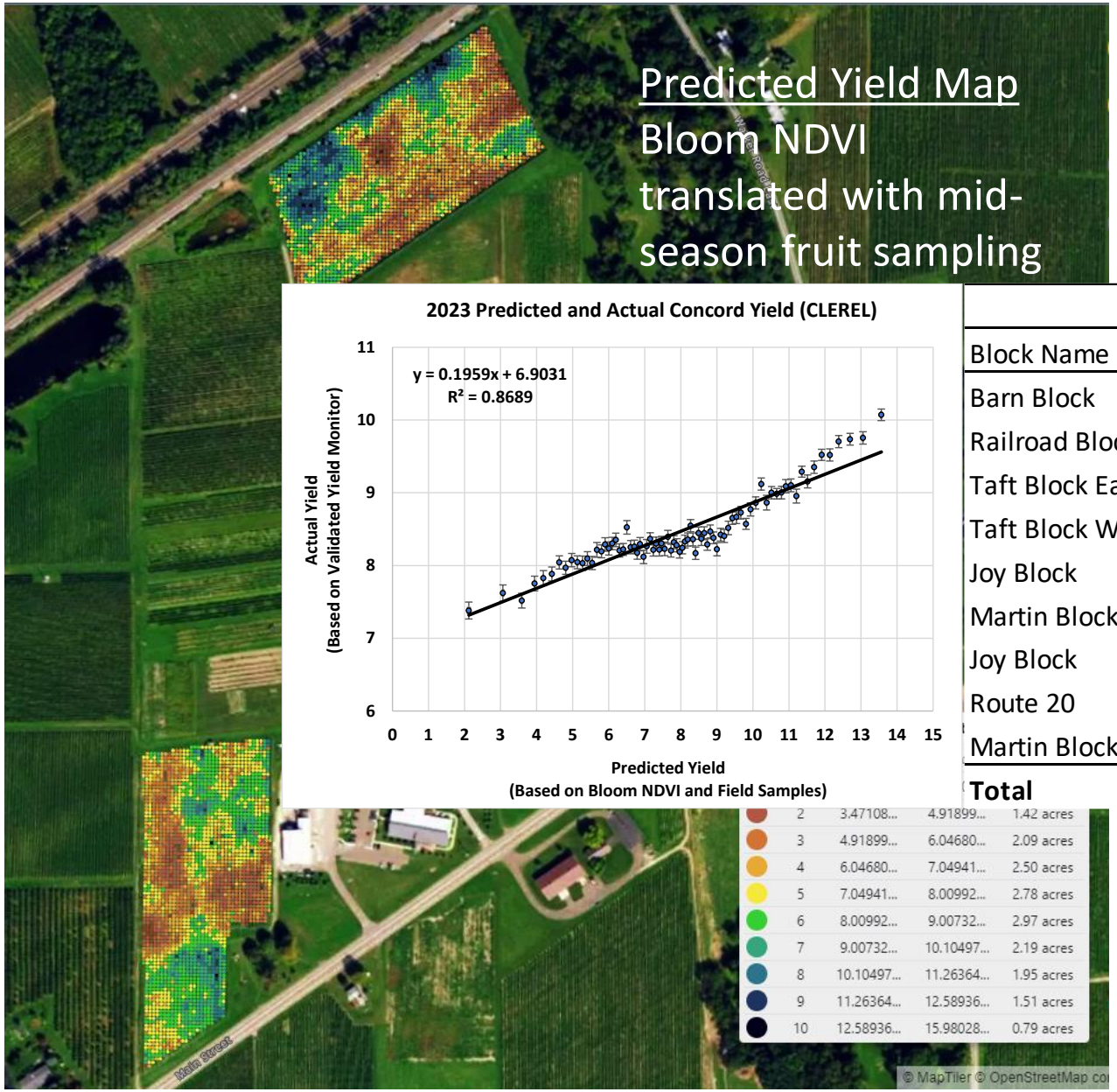
Row Spacing determines length of 1/100th of an acre
10.0 feet row spacing = 43.5 feet = 1/100th of an acre
9.5 feet = 45.9 feet = 1/100th of an acre
9.0 feet = 48.4 feet = 1/100th of an acre
8.5 feet = 51.2 feet = 1/100th of an acre
8.0 feet = 54.45 feet = 1/100th of an acre
7.5 feet = 58.1 feet = 1/100th of an acre

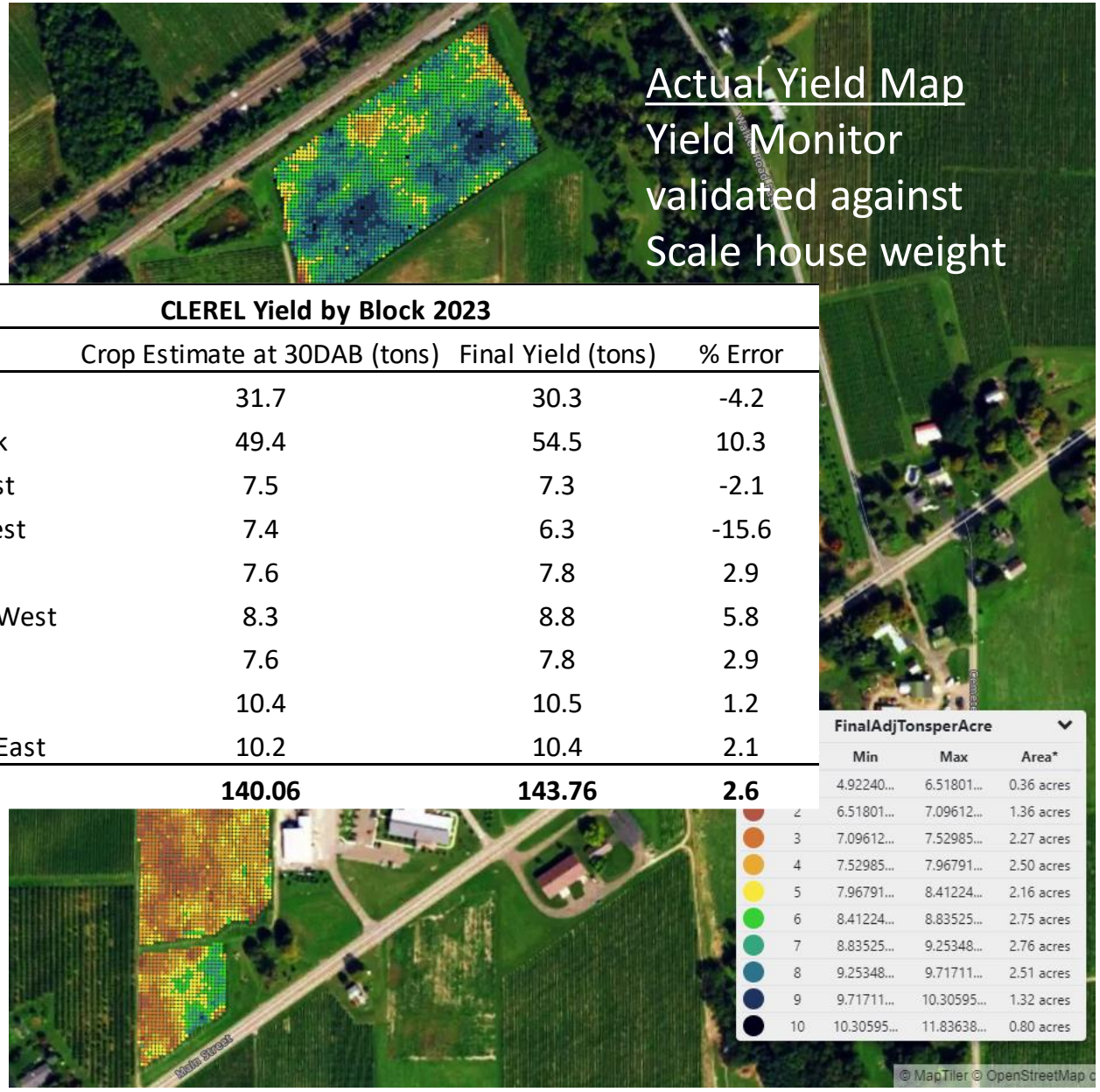
Calculation
43, 560 square feet per acre
Divide by row spacing and then
divide by 100 to get 1/100th of an acre

Example:
A grower has 9 foot row spacing and clean picks 48.4 feet at 25 days after bloom. The fruit weighs 80 pounds and the grower estimates that the berries are between 35% and 40% of final berry weight. According to the table, the crop estimate is between 10.0 and 11.4 tons per acre.

Disclaimer:
This table gives the relationship between time of season and % final berry weight on an average year. Year to year variability in weather related berry growth adds error to this table. Information on current year berry growth can be obtained from the Fredonia Vineyard Lab (or) it is strongly suggested that individual growers start collecting berry weight information from their own individual vineyard blocks.

Translation:
Going from Data to Information





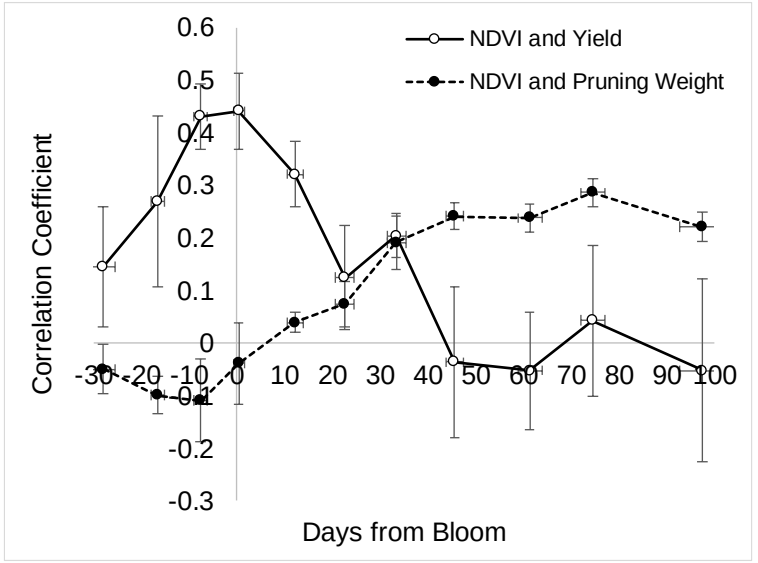
CLEREL Yield by Block 2023

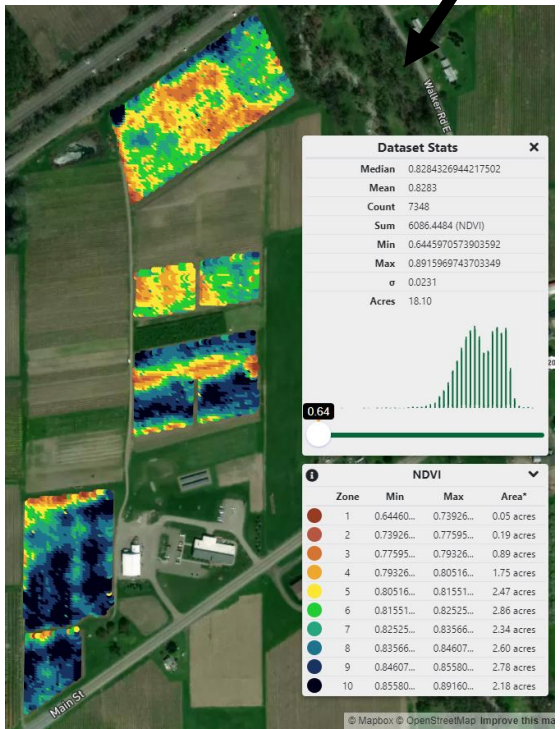
Block Name	Crop Estimate at 30DAB (tons)	Final Yield (tons)	% Error
Barn Block	31.7	30.3	-4.2
Railroad Block	49.4	54.5	10.3
Taft Block East	7.5	7.3	-2.1
Taft Block West	7.4	6.3	-15.6
Joy Block	7.6	7.8	2.9
Martin Block West	8.3	8.8	5.8
Joy Block	7.6	7.8	2.9
Route 20	10.4	10.5	1.2
Martin Block East	10.2	10.4	2.1
Total	**140.06**	**143.76**	**2.6**

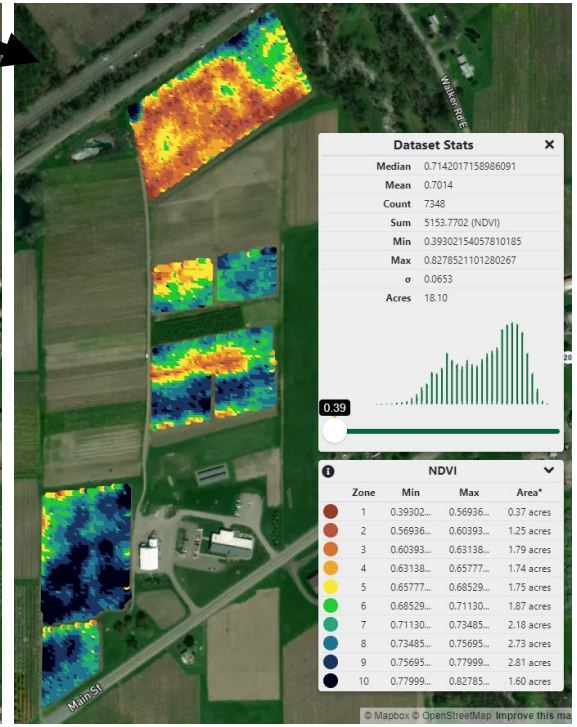

2023 Estimate: 1900.0 tons
2023 Delivered: 1925.2 tons
1.3% Error
Adjusted_1
Zone Min Max Area*
1 0.02382... 2.38142... 5.61 acres
2 2.38142... 3.8916 8.99 acres
3 3.8916 5.15326... 12.82 acres
4 5.15326... 6.26367... 16.89 acres
5 6.26367... 7.29133... 19.24 acres
6 7.29133... 8.30756... 19.12 acres
7 8.30756... 9.38166... 17.28 acres
8 9.38166... 10.59558... 13.59 acres
9 10.59558... 12.15336... 9.22 acres
10 12.15336... 14.57527... 4.69 acres
© Mapbox © OpenStreetMap Improve
Blocks
© MapTiler © OpenStreetMap contributors
mapbox

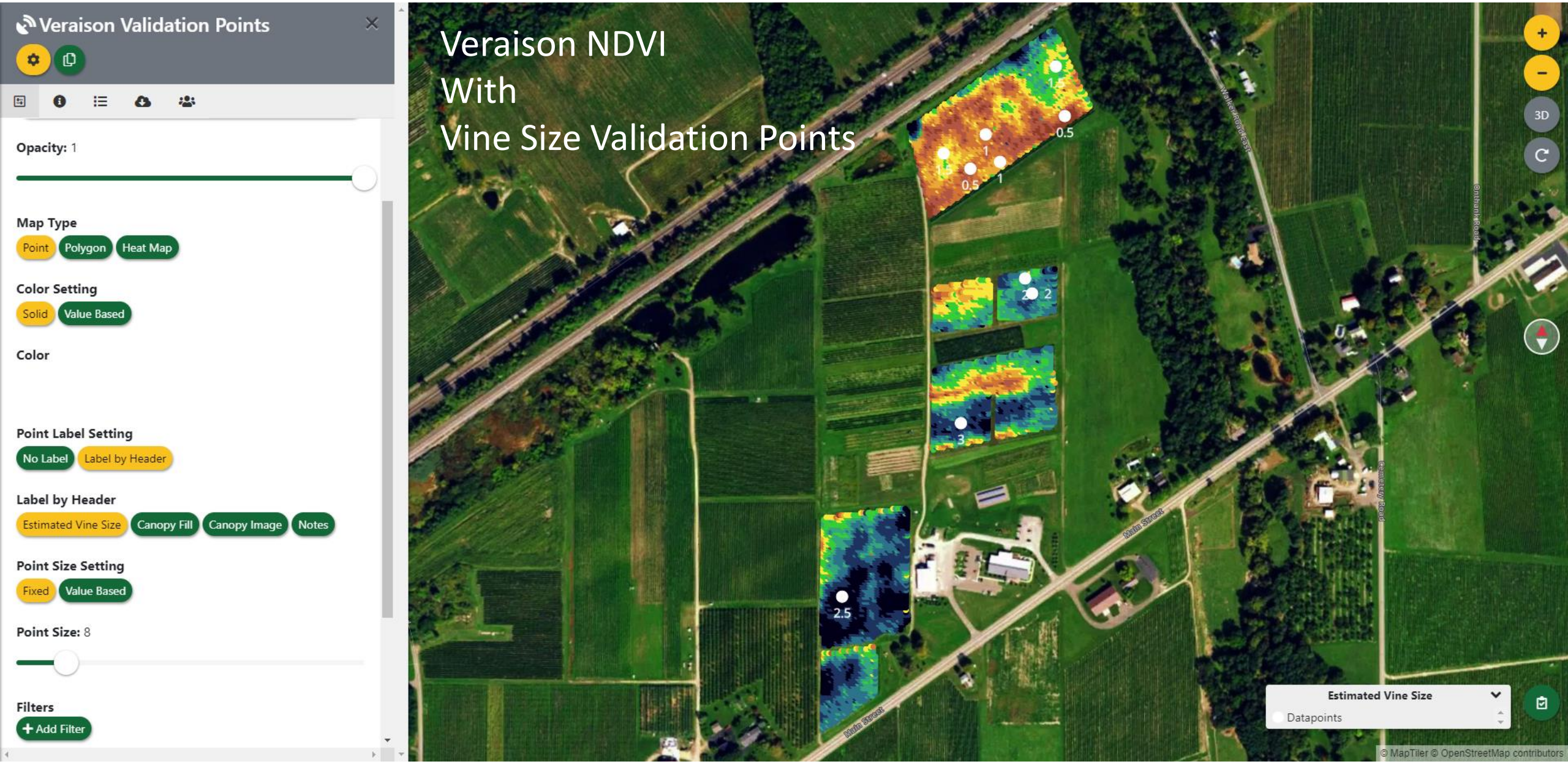
Estimated Vine Size (pounds/vine)

0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0





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Map Type
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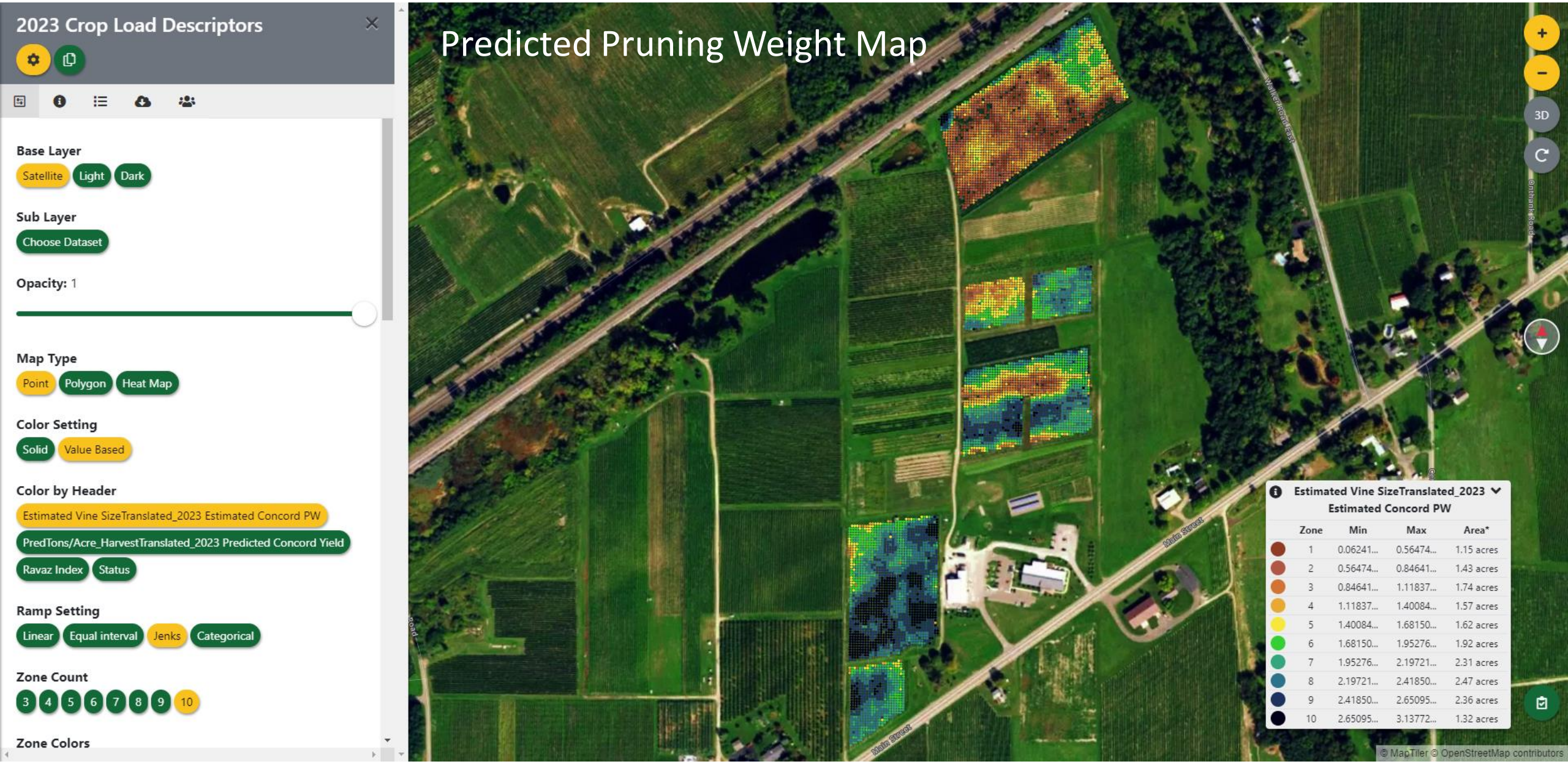
Polygon
Heat Map
Color Setting
Solid
Value Based
Color
Point Label Setting
No Label
Label by Header
Label by Header
Estimated Vine Size
Canopy Fill
Canopy Image
Notes
Point Size Setting
Fixed
Value Based
Point Size: 8
Filters
+ Add Filter
Veraison NDVI
With
Vine Size Validation Points
3D
Estimated Vine Size
Datapoints
Main Street
Gerrsbery Road
© MapTiler © OpenStreetMap contributors


2023 Crop Load Descriptors
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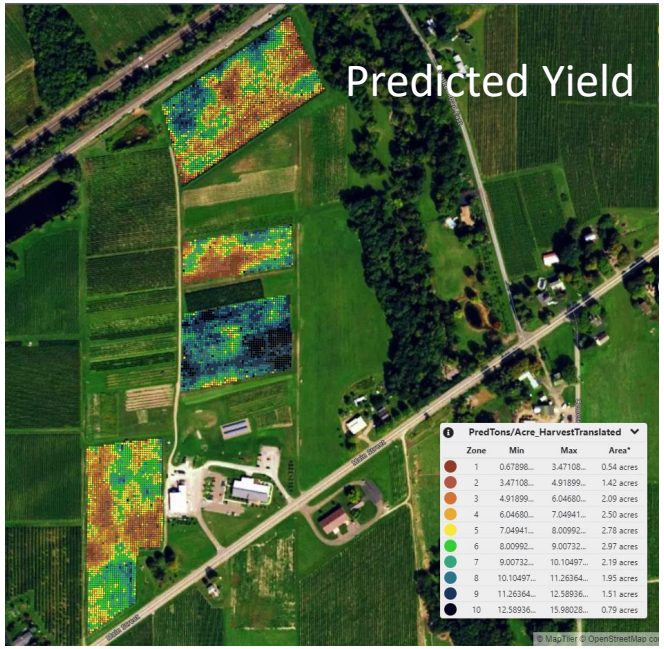
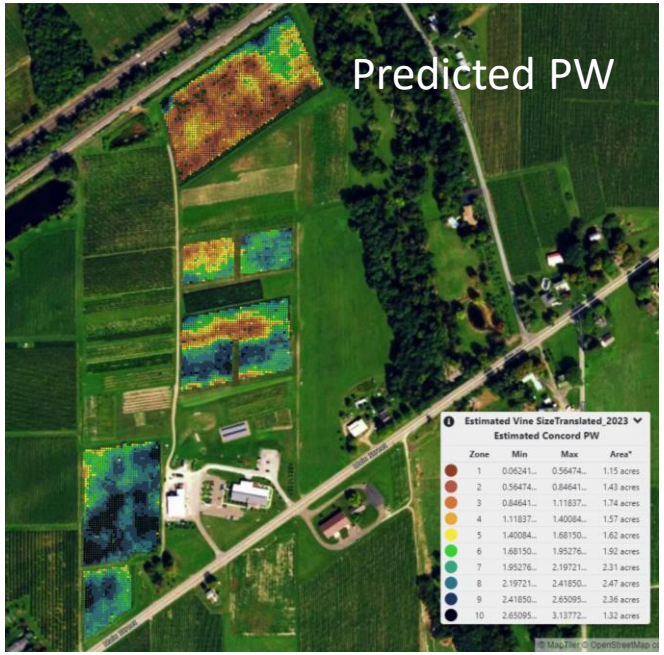
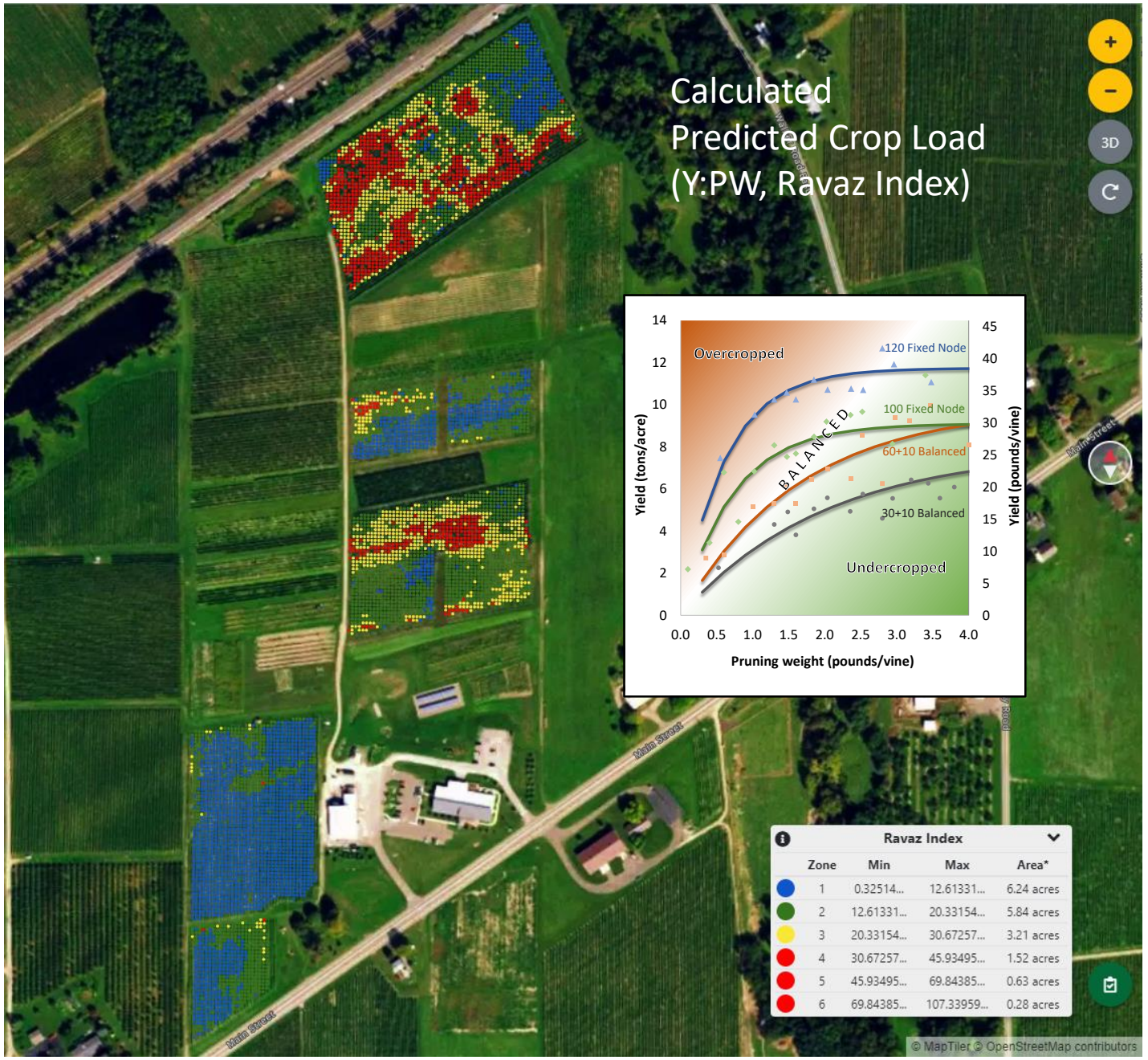
Satellite
Light
Dark
Sub Layer
Choose Dataset
Opacity: 1
Map Type
Point
Polygon
Heat Map
Color Setting
Solid
Value Based
Color by Header
Estimated Vine SizeTranslated_2023 Estimated Concord PW
PredTons/Acre_HarvestTranslated_2023 Predicted Concord Yield
Ravaz Index
Status
Ramp Setting
Linear
Equal interval
Jenks
Categorical
Zone Count
3 4 5 6 7 8 9 10
Zone Colors
Predicted Pruning Weight Map
3D
Main Street
Estimated Vine SizeTranslated_2023
Estimated Concord PW
Zone Min Max Area*
1 0.06241... 0.56474... 1.15 acres
2 0.56474... 0.84641... 1.43 acres
3 0.84641... 1.11837... 1.74 acres
4 1.11837... 1.40084... 1.57 acres
5 1.40084... 1.68150... 1.62 acres
6 1.68150... 1.95276... 1.92 acres
7 1.95276... 2.19721... 2.31 acres
8 2.19721... 2.41850... 2.47 acres
9 2.41850... 2.65095... 2.36 acres
10 2.65095... 3.13772... 1.32 acres
© MapTiler © OpenStreetMap contributors


Predicted Yield
PredTons/Acre_HarvestTranslated
Zone Min Max Area*
1 0.67898... 3.47108... 0.54 acres
2 3.47108... 4.91899... 1.42 acres
3 4.91899... 6.04680... 2.09 acres
4 6.04680... 7.04941... 2.50 acres
5 7.04941... 8.00992... 2.78 acres
6 8.00992... 9.00732... 2.97 acres
7 9.00732... 10.10497... 2.19 acres
8 10.10497... 11.26364... 1.95 acres
9 11.26364... 12.58936... 1.51 acres
10 12.58936... 15.98028... 0.79 acres


Predicted PW
Estimated Vine SizeTranslated_2023
Estimated Concord PW
Zone Min Max Area*
1 0.06241... 0.56474... 1.15 acres
2 0.56474... 0.84641... 1.43 acres
3 0.84641... 1.11837... 1.74 acres
4 1.11837... 1.40084... 1.57 acres
5 1.40084... 1.68150... 1.62 acres
6 1.68150... 1.95276... 1.92 acres
7 1.95276... 2.19721... 2.31 acres
8 2.19721... 2.41850... 2.47 acres
9 2.41850... 2.65095... 2.36 acres
10 2.65095... 3.13772... 1.32 acres

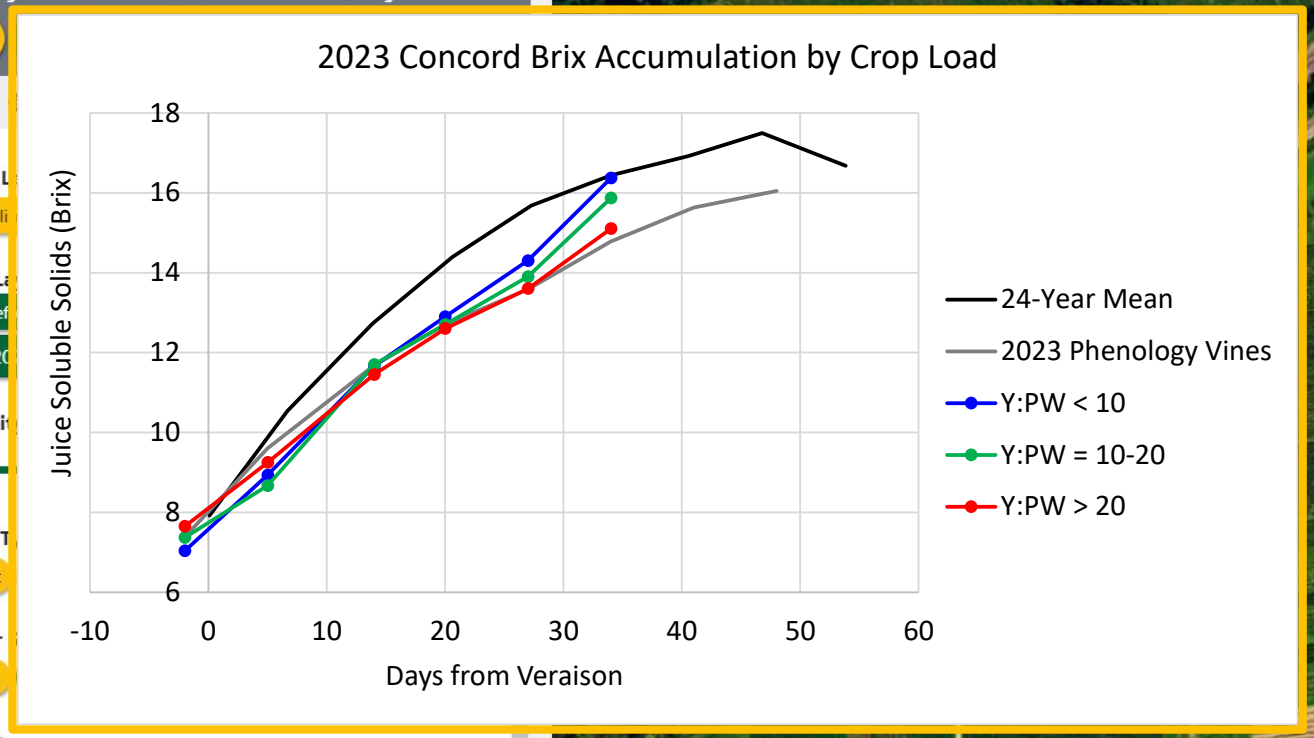

Calculated
Predicted Crop Load
(Y:PW, Ravaz Index)
3D
Overcropped
120 Fixed Node
100 Fixed Node
BALANCED
60+10 Balanced
30+10 Balanced
Undercropped
Yield (tons/acre)
Yield (pounds/vine)
Pruning weight (pounds/vine)
0 2 4 6 8 10 12 14
0 5 10 15 20 25 30 35 40 45
0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0
Ravaz Index
Zone Min Max Area*
1 0.32514... 12.61331... 6.24 acres
2 12.61331... 20.33154... 5.84 acres
3 20.33154... 30.67257... 3.21 acres
4 30.67257... 45.93495... 1.52 acres
5 45.93495... 69.84385... 0.63 acres
6 69.84385... 107.33959... 0.28 acres
Main Street
© MapTiler © OpenStreetMap contributors

myEV

my.efficientvineyard.com/f/3R76y7FHOPwY5aXx6qFV/dataset/zFfLiOCqsuLPkRje9IOU

Bookmarks | Work | Social | Media | Other | Passkey bookmarklet | Kitchen | Equipment | Gmail | YouTube | Maps

Copy_2023 Concord V to H Berry Sa...



Base L

Satelli

Sub La

Ref

20

Opaci

Map T

Point

Color

Solid

Color

Point Label Setting

No Label | Label by Header

Point Size Setting

Fixed | Value Based

Point Size: 8

Filters

+ Add Filter

3D

Main Street

Main Street

Sample Number

Datapoints

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Variable-Rate Crop Load Management

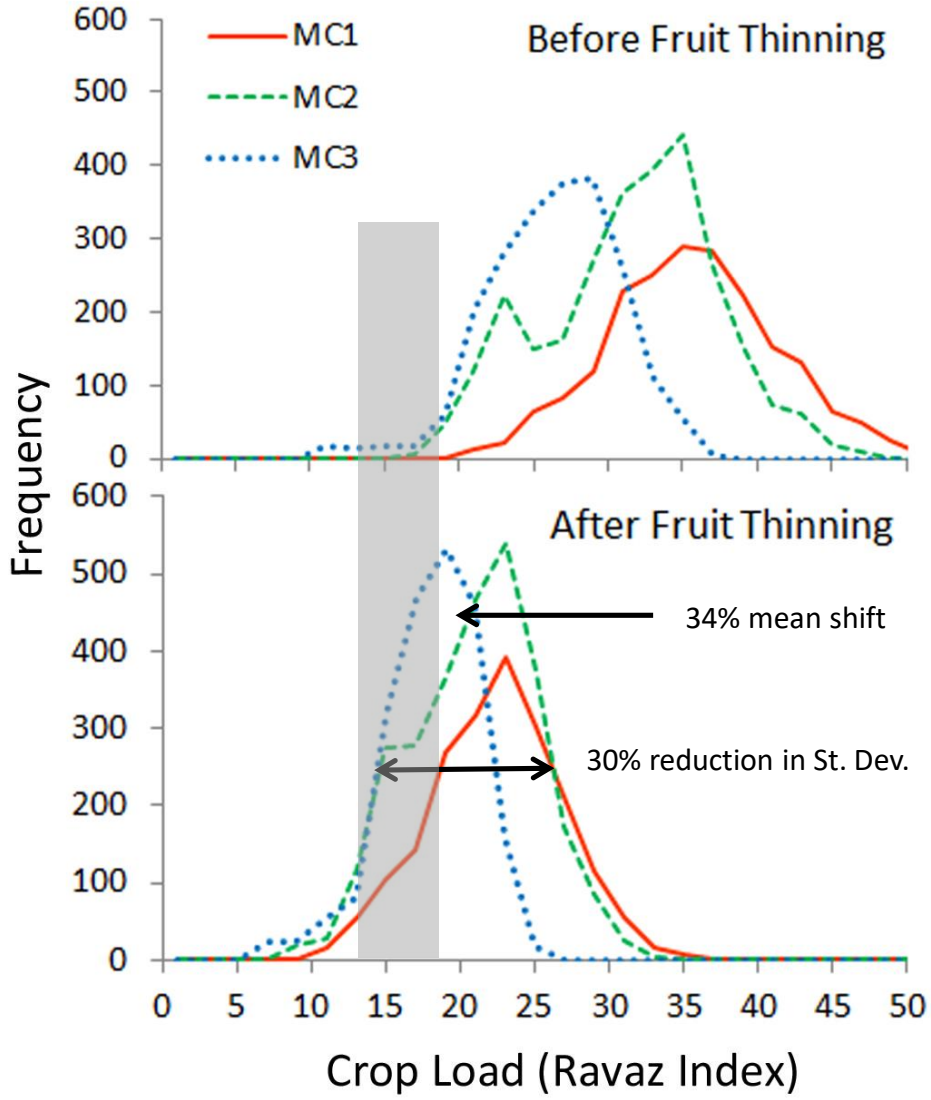
efficient vineyard

Efficient Vineyard Home CLEREL Viticulture Blog myEV Documentation

Variable-rate Fruit Thinning for Concord Crop Load Balance

Jul 16 • Written By Terry Bates

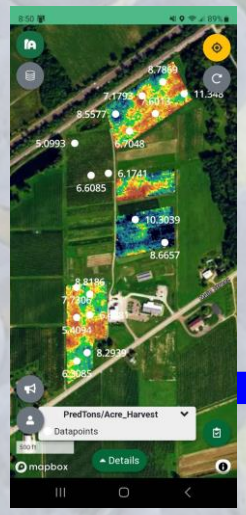
This video describes how we integrate viticulture information, spatial NDVI data, stratified crop estimation, and VR vineyard mechanization technology for variable-rate crop load management in NY Concord vineyards.



Ravaz Index = 30.1
St. Dev. = 6.5

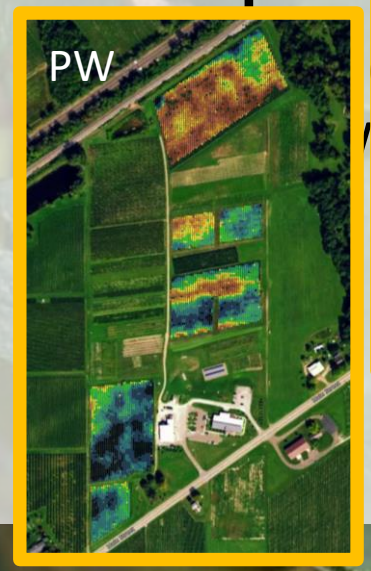
Ravaz Index = 19.8
St. Dev. = 4.6

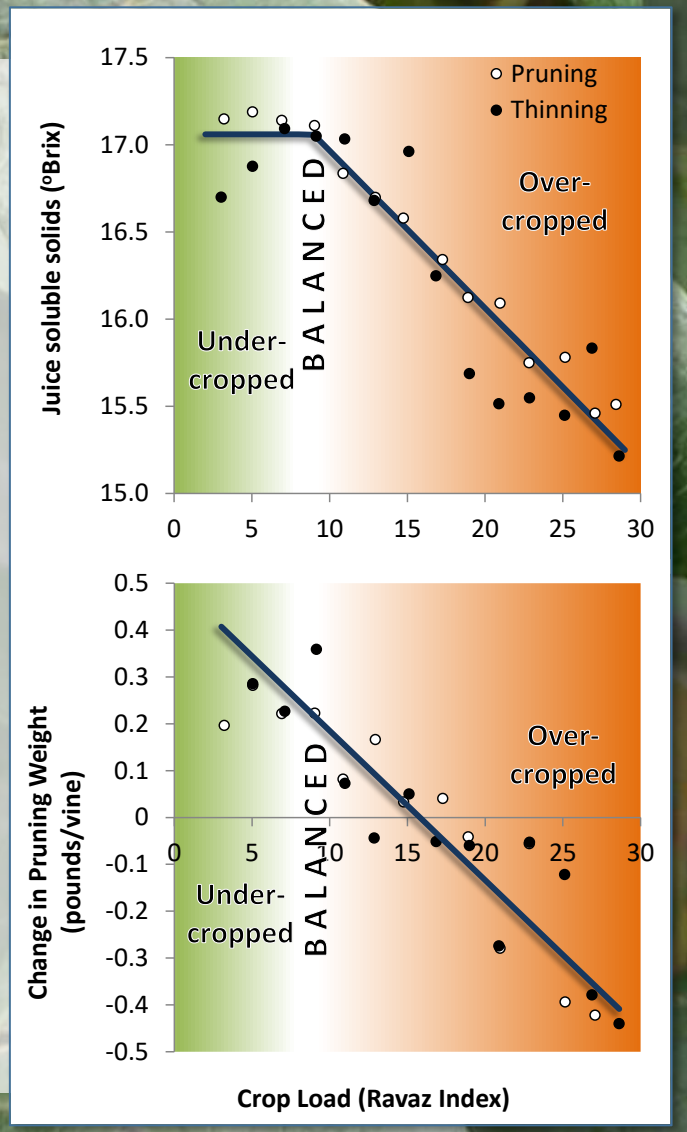
Estimate



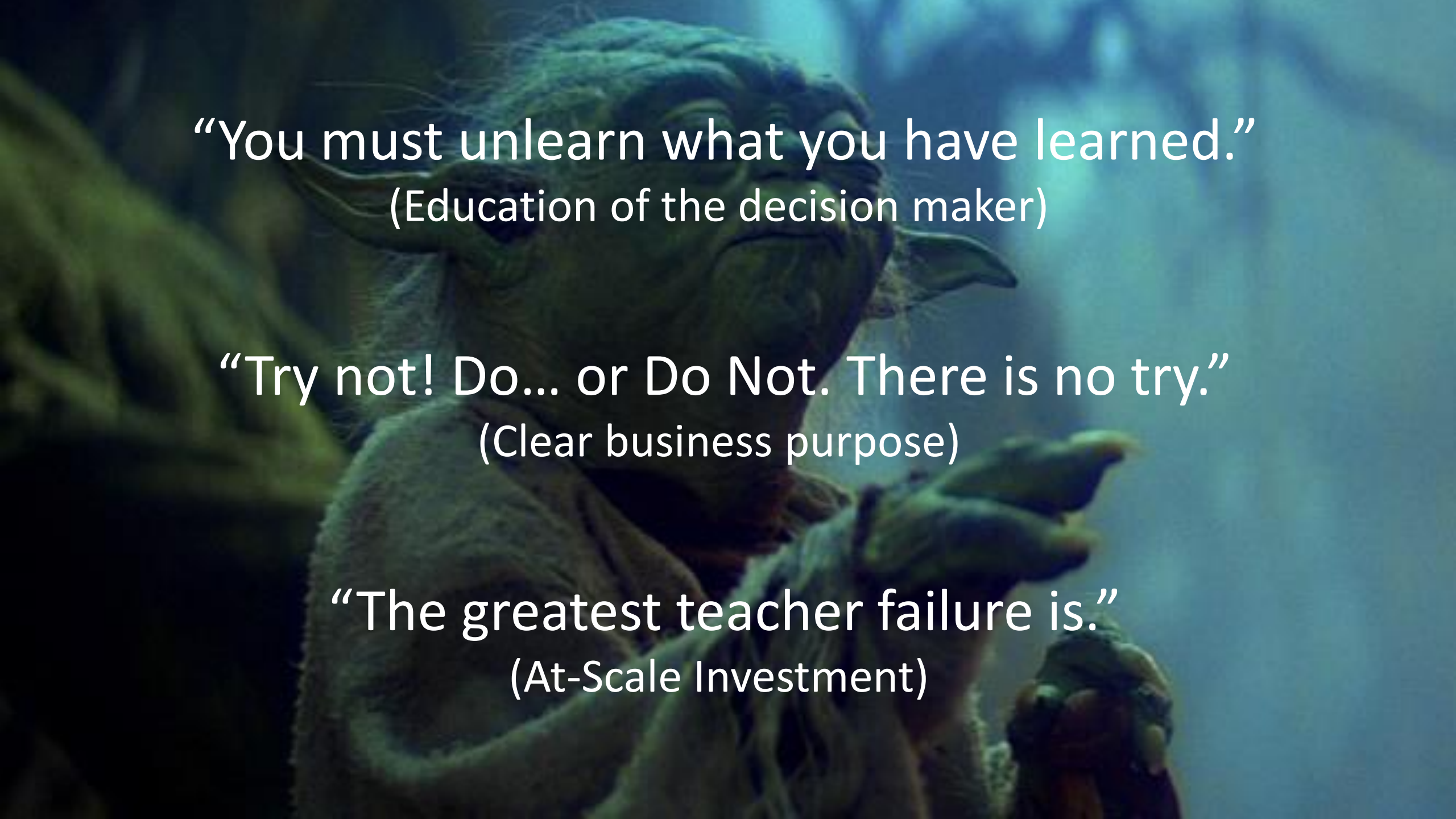
Vine Size

in





"What it takes to win is simple, it's not easy." — Marv Levy


“You must unlearn what you have learned.”
(Education of the decision maker)
“Try not! Do… or Do Not. There is no try.”
(Clear business purpose)
“The greatest teacher failure is.”
(At-Scale Investment)