Compost Preparation and Use at a Commercial Nursery of Western Canada

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and Compost Use in Horticulture
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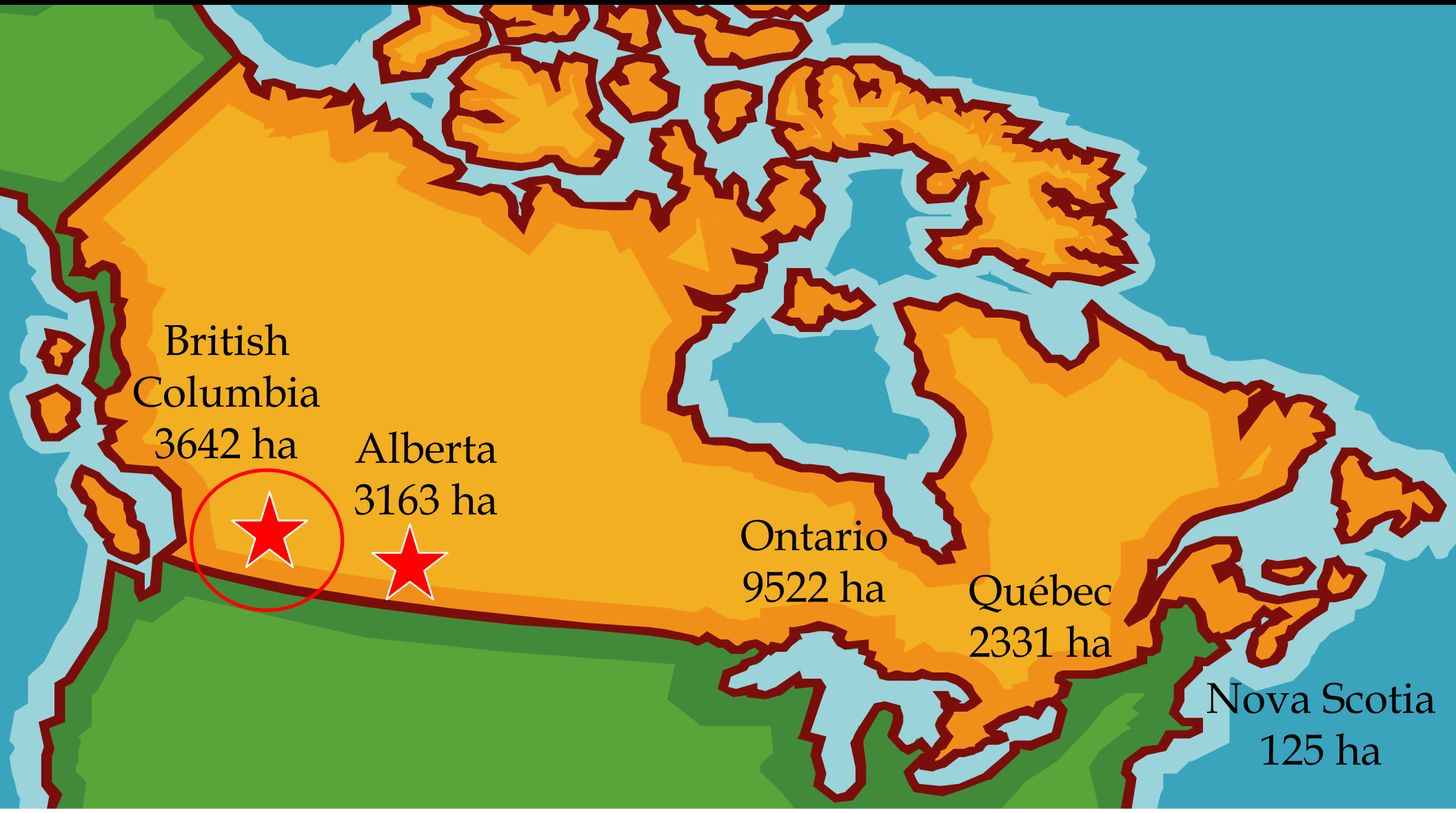
Nursery production areas in Canada

Source: Statistics Canada, Sod & Nursery Industry Survey, 2011



Byland's Nurseries (www.bylands.com)
2011 International Nursery of the Year
International Association of Horticultural Producers (www.aiph.org)

Compost Preparation and Use at a Commercial Nursery of Western Canada

1) Compost preparation
2) Use in field production
3) Use in container production
4) Future research

Raw ingredients are plant refuse
From the nursery and the municipal landfill

Production of finished compost per year:
Good quality 14000 m^3 / High quality 6000 m^3

Core temperatures are monitored weekly
Target composting temperature is 50 to 60°C

Piles are turned to manage temperatures
Aim is to turn 3 times during composting cycle

Temperatures in compost pile (1996)

(°C at 1.2 meters deep, each point is the mean of 8 measures)

Target was 55 to 65°C

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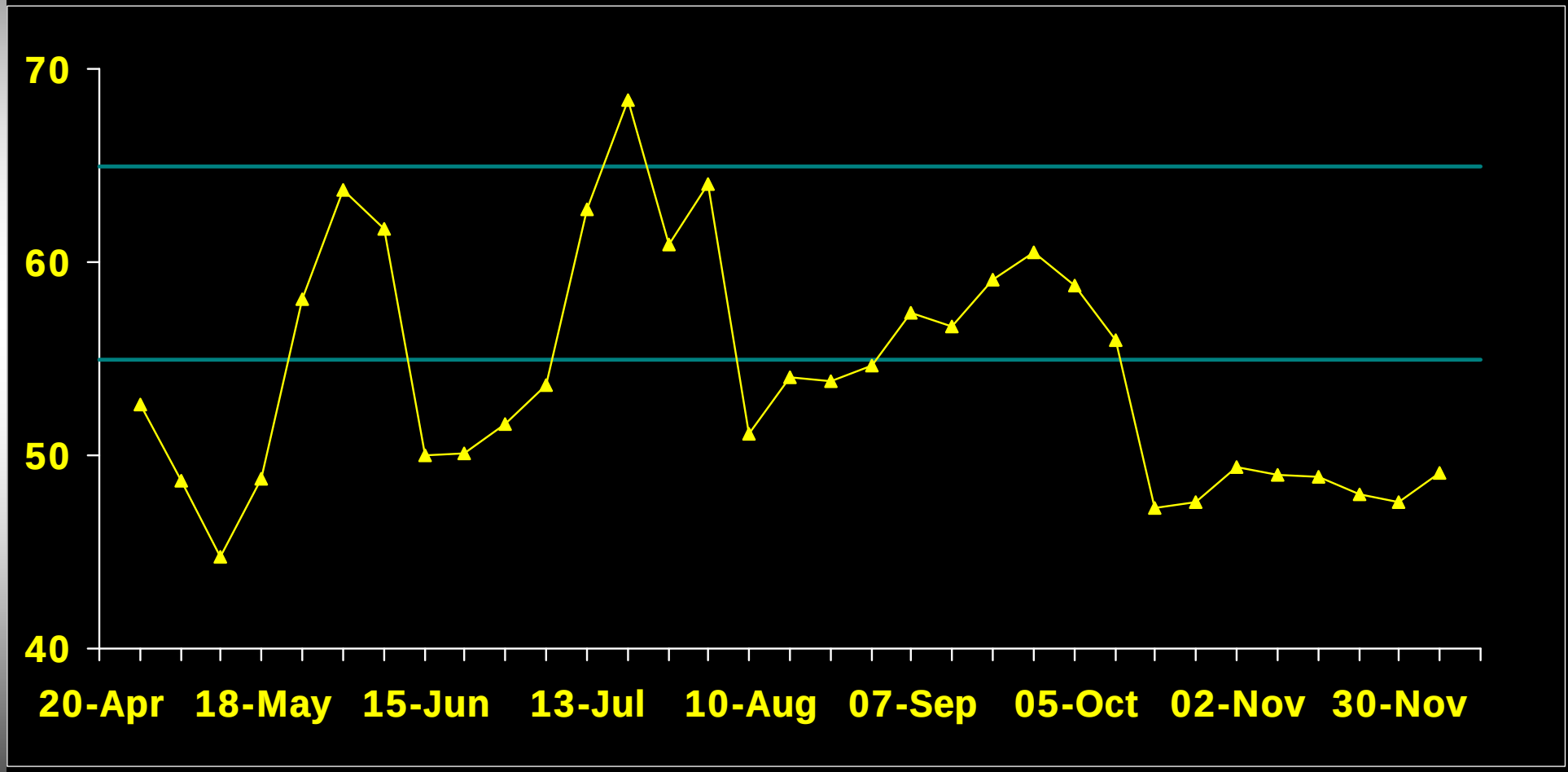
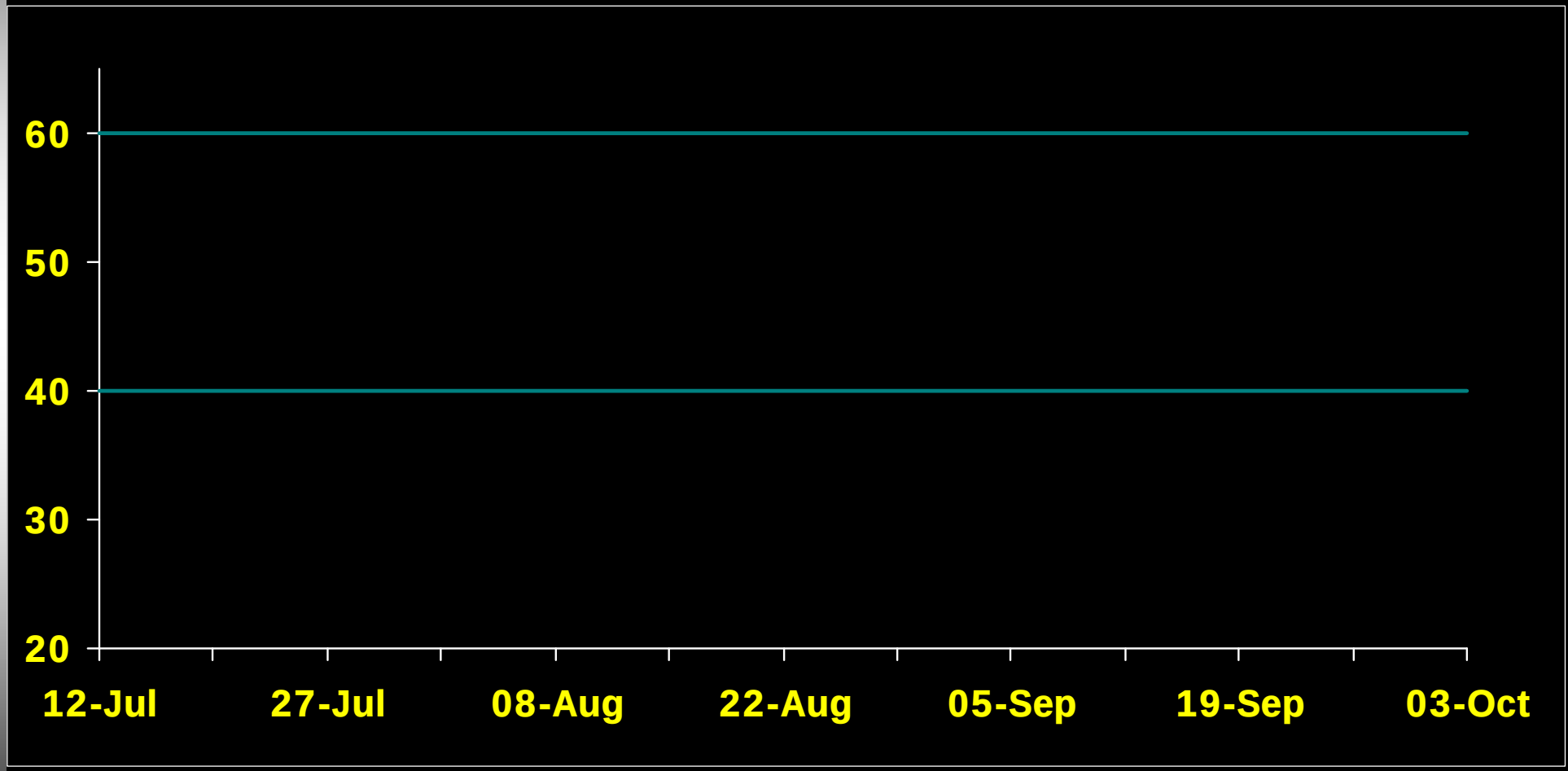


Compost piles are watered regularly
Moisture content is measured by dry weight

Moisture content in compost pile (2012)

(% after drying 48 hours at 80°C)

Target is 40 to 60% water content



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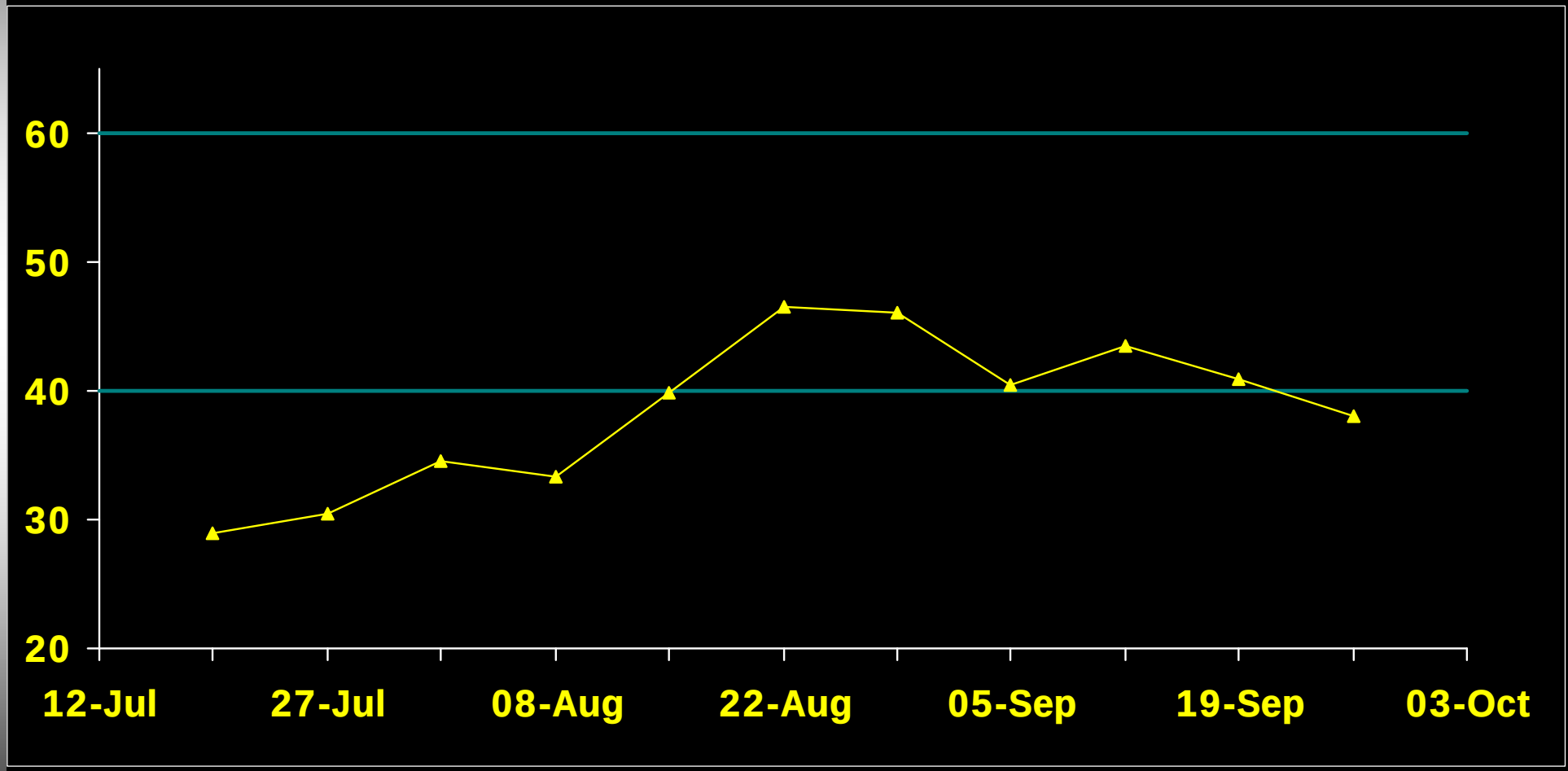
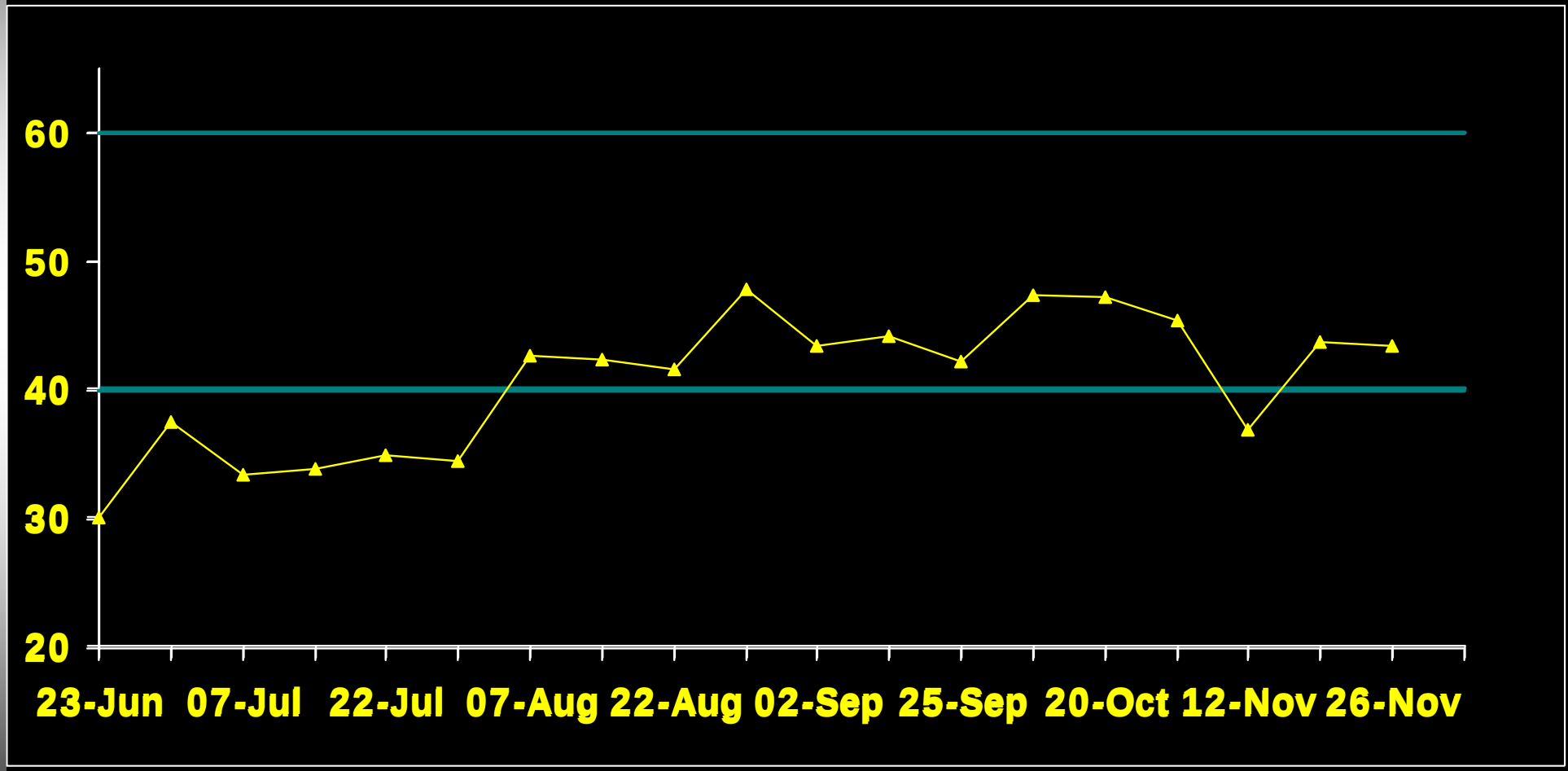


Moisture content in compost pile (2009)

(% after drying 48 hours at 80°C)

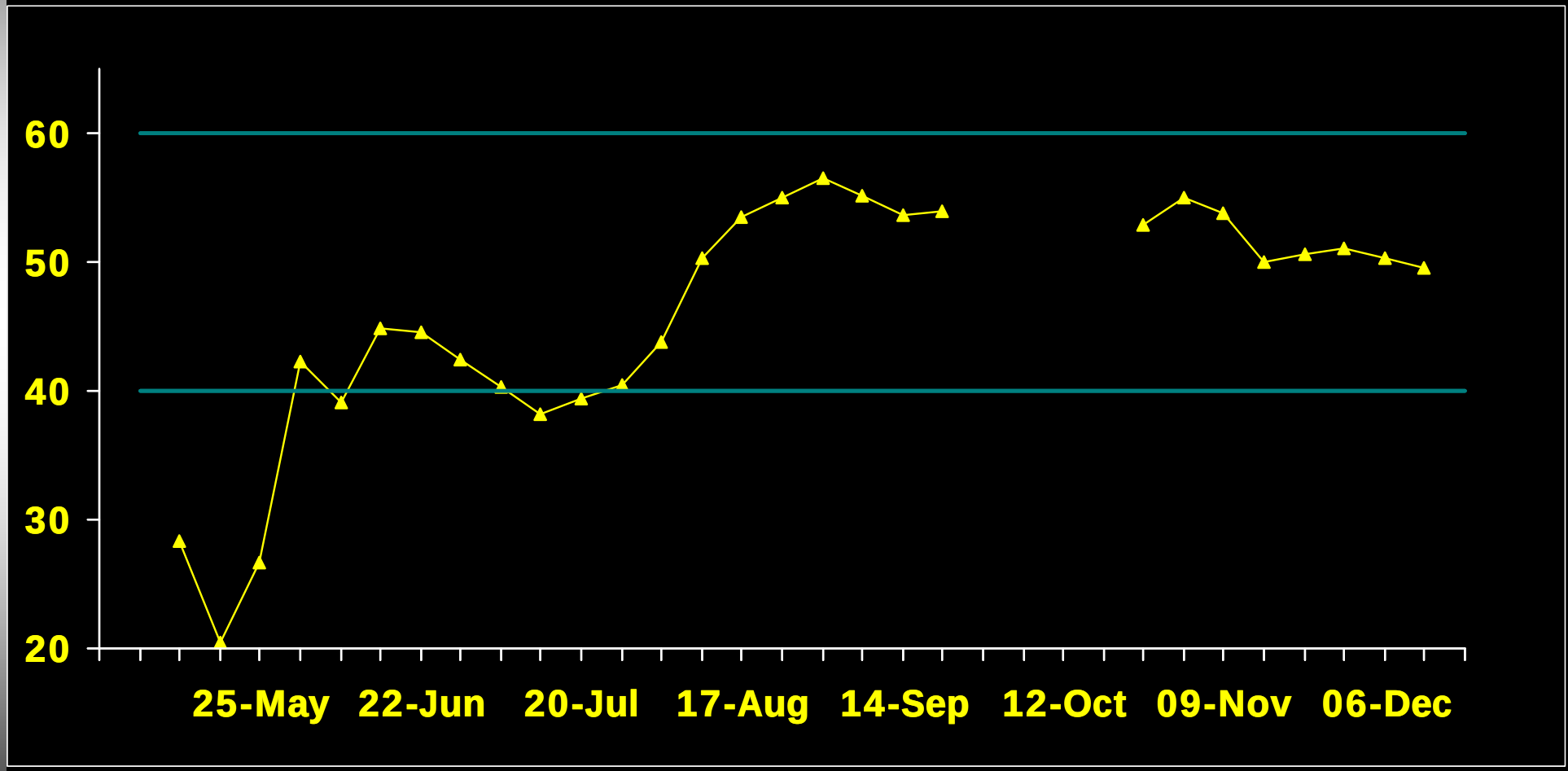
Target is 40 to 60% water content



Moisture content in compost pile (2005)

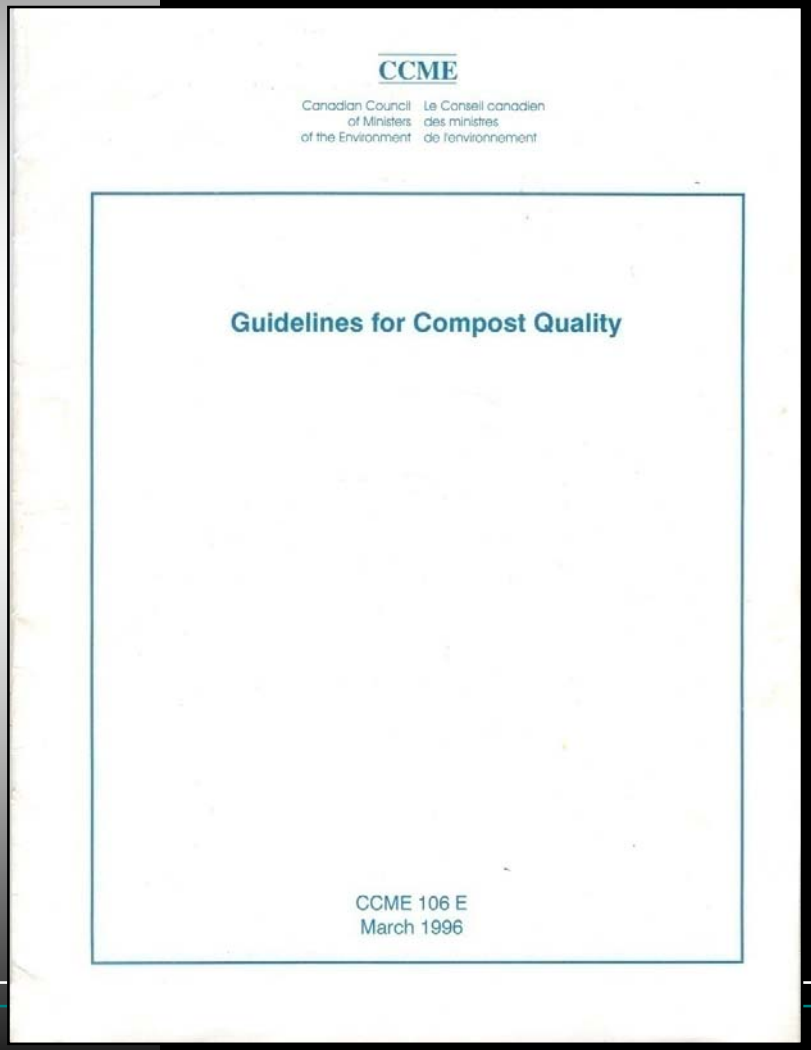
(% after drying 48 hours at 80°C)

Target is 40 to 60% water content



Testing finished compost for maturity

Canadian Council of Ministers of the Environment (1996)


CCME

Canadian Council of Ministers of the Environment | Le Conseil canadien des ministres de l'environnement

Guidelines for Compost Quality

CCME 106 E
March 1996

- C:N ratio is less than 25
  and
  Oxygen uptake shall be less than 150 mg O_2/kg of organic matter per hour
  and
  Using cress or radish,
  seed germination is 90% of control
  and growth rate is 50% of control
  or
- Material is cured for 21 days and stays within 20°C of ambient temperature
  or
- The material is cured for 6 months without re-heating.

Cucumber seed germination test

Compost must be 90% germination and 50% growth of control

Compost Preparation and Use at a Commercial Nursery of Western Canada

1) Compost preparation: Challenges
2) Use in field production
3) Use in container production
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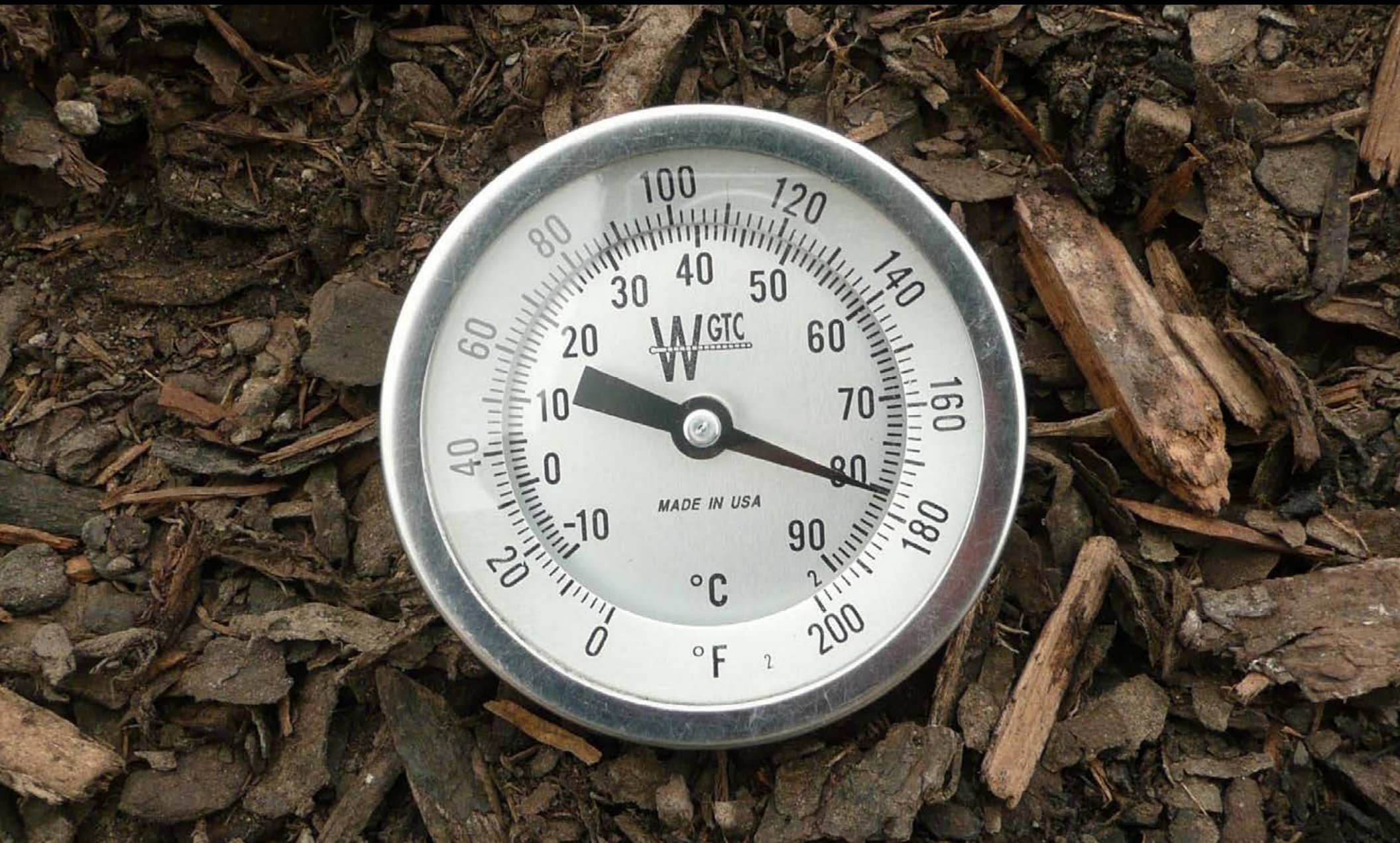
Challenge # 1: Obtaining the correct C:N ratio

Grape pomace from wine making – Excellent C:N
Wood residue from sawmills – Very high C:N

Challenge # 2: Very high temperatures



Compost is too hot – It starts a fire

Compost is too hot – It starts a fire
Then you are in the newspaper…

CAPITAL news

The Central Okanagan's Best-read Newspaper

SEAN CONNOR/CAPITAL NEWS

COMPOST IGNITES… Kelowna fire fighters were called out Saturday to deal with a fire that resulted from spontaneous combustion of a compost heap at the former Russo sawmill on Old Vernon Road. See story on A3.

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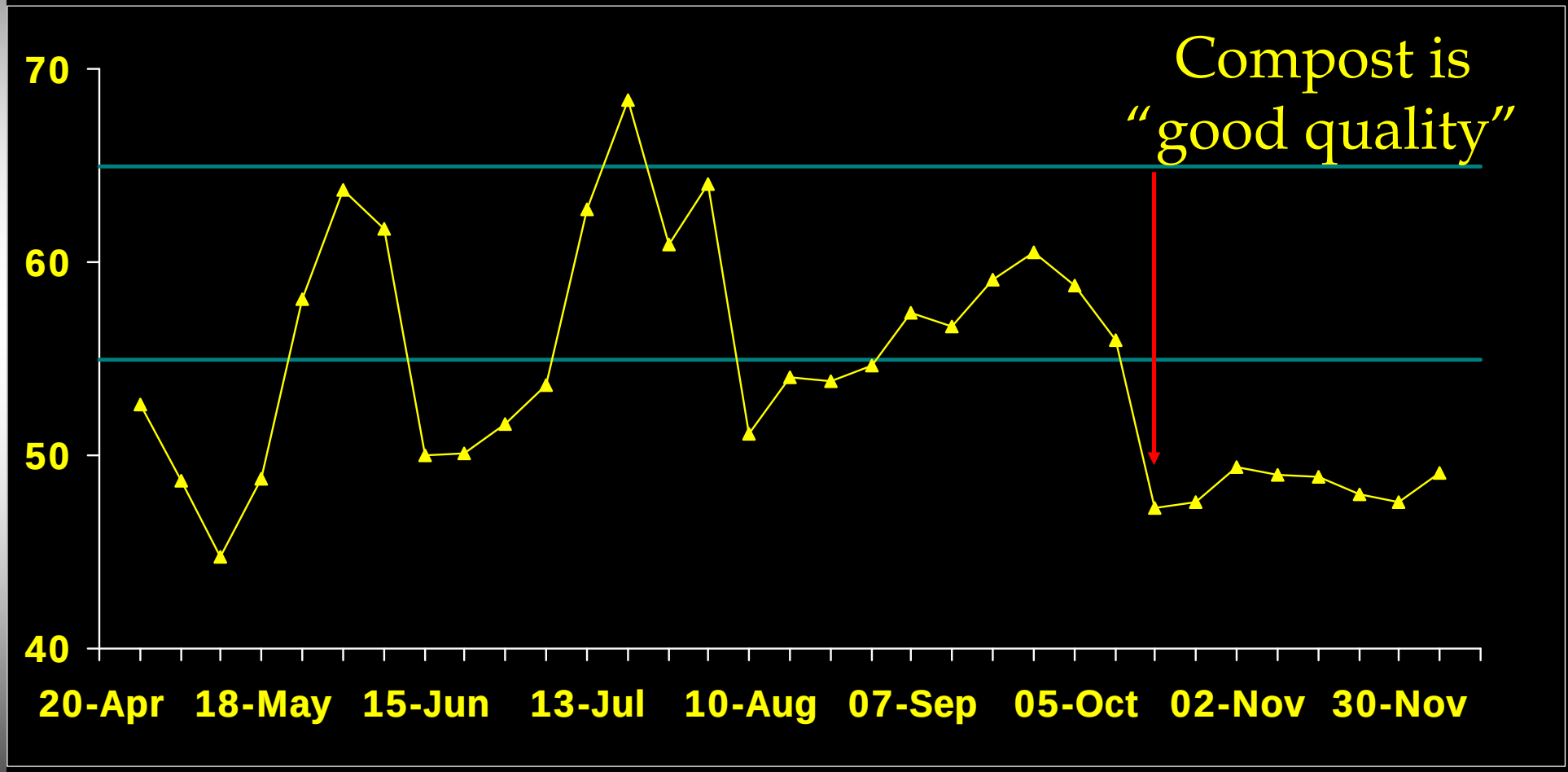
Recall our temperatures in the compost pile

(°C at 1.2 meters deep, each point is the mean of 8 measures)



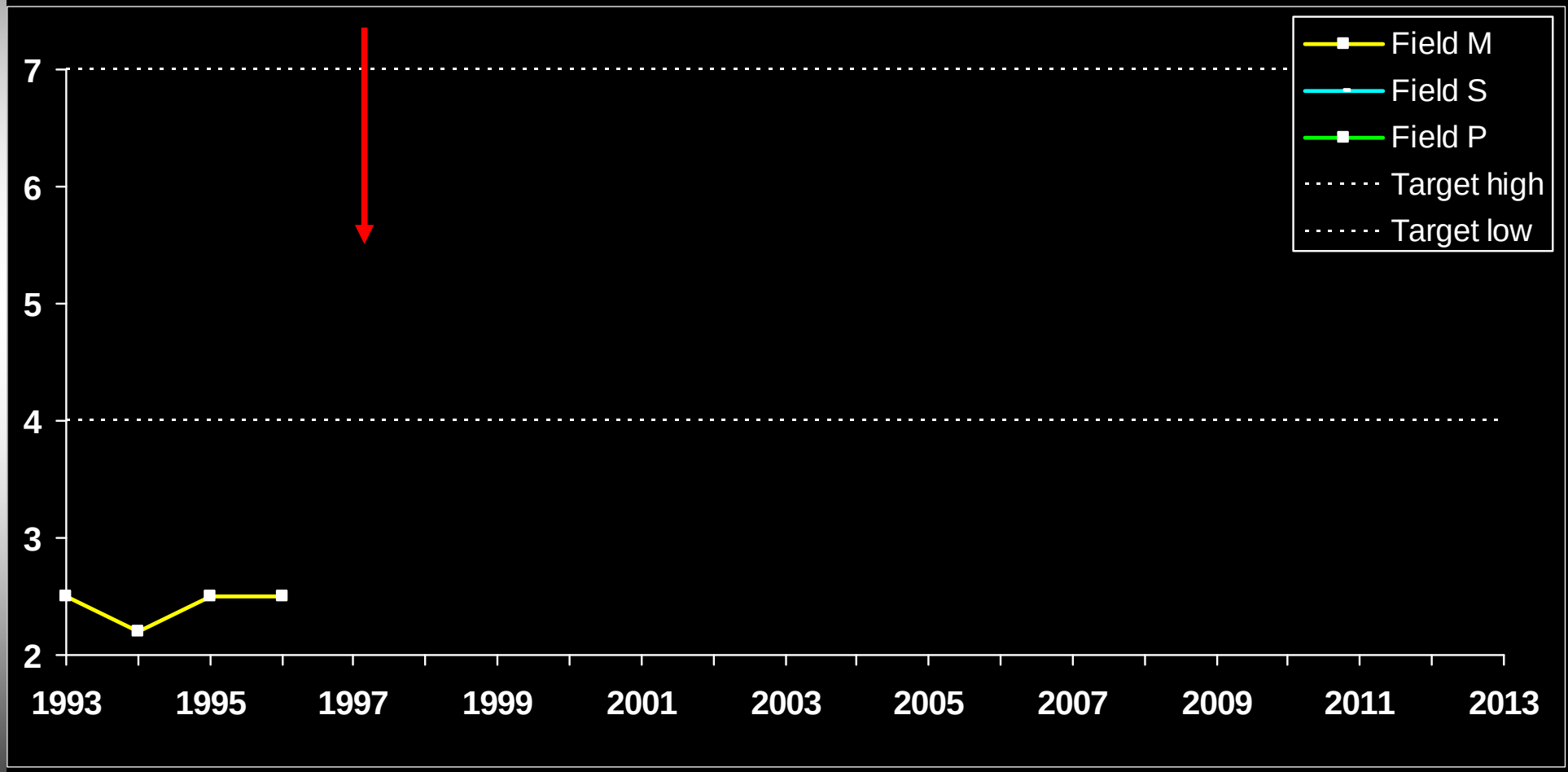
Trees are harvested every 2 to 3 years

Compost is applied in fall after harvest of trees

Soil organic matter in 3 different fields

(Target is 4 to 8 %)

Compost applied since 1997 at 250 to 500 m^3 / ha / 2 years



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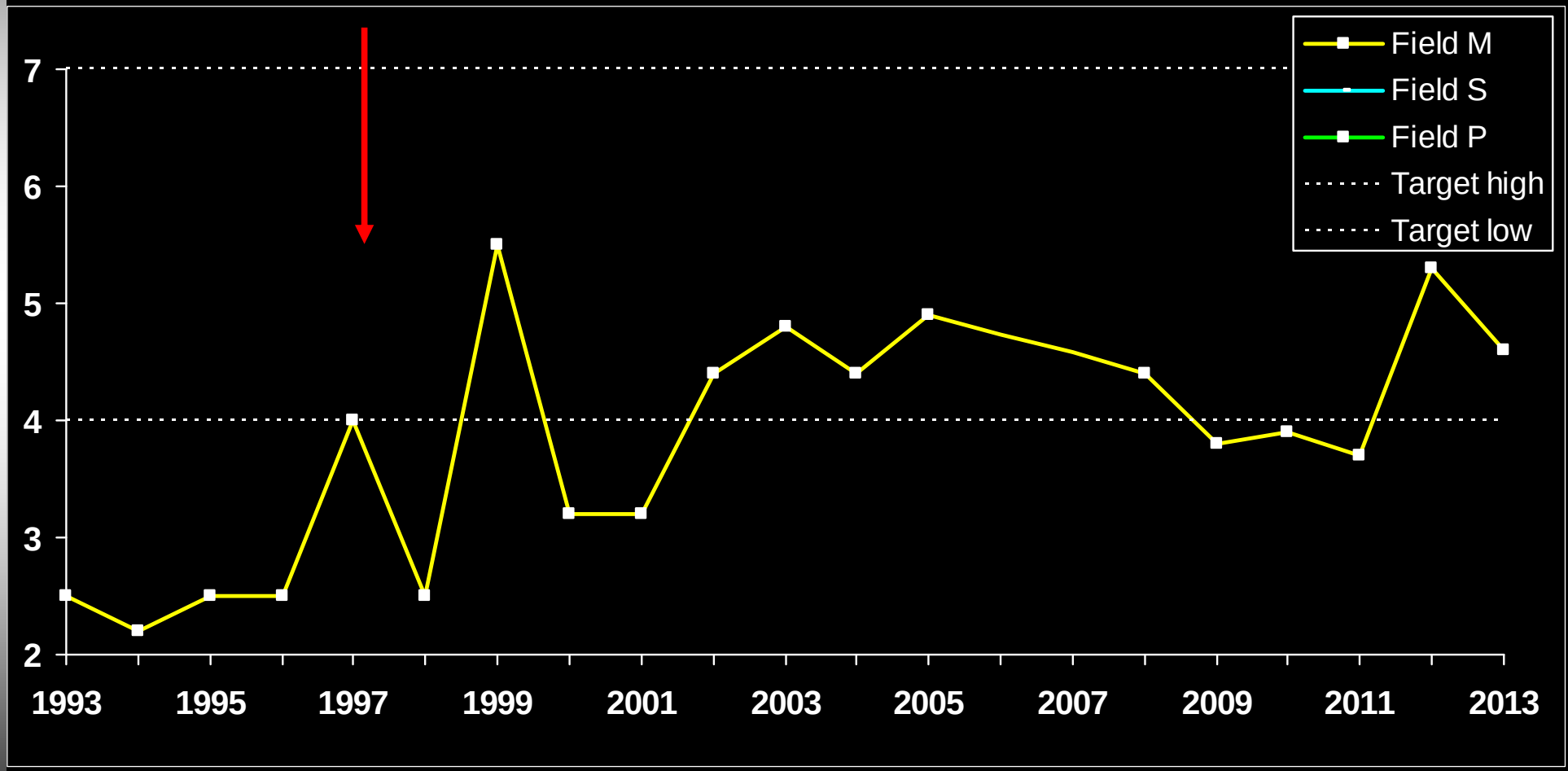

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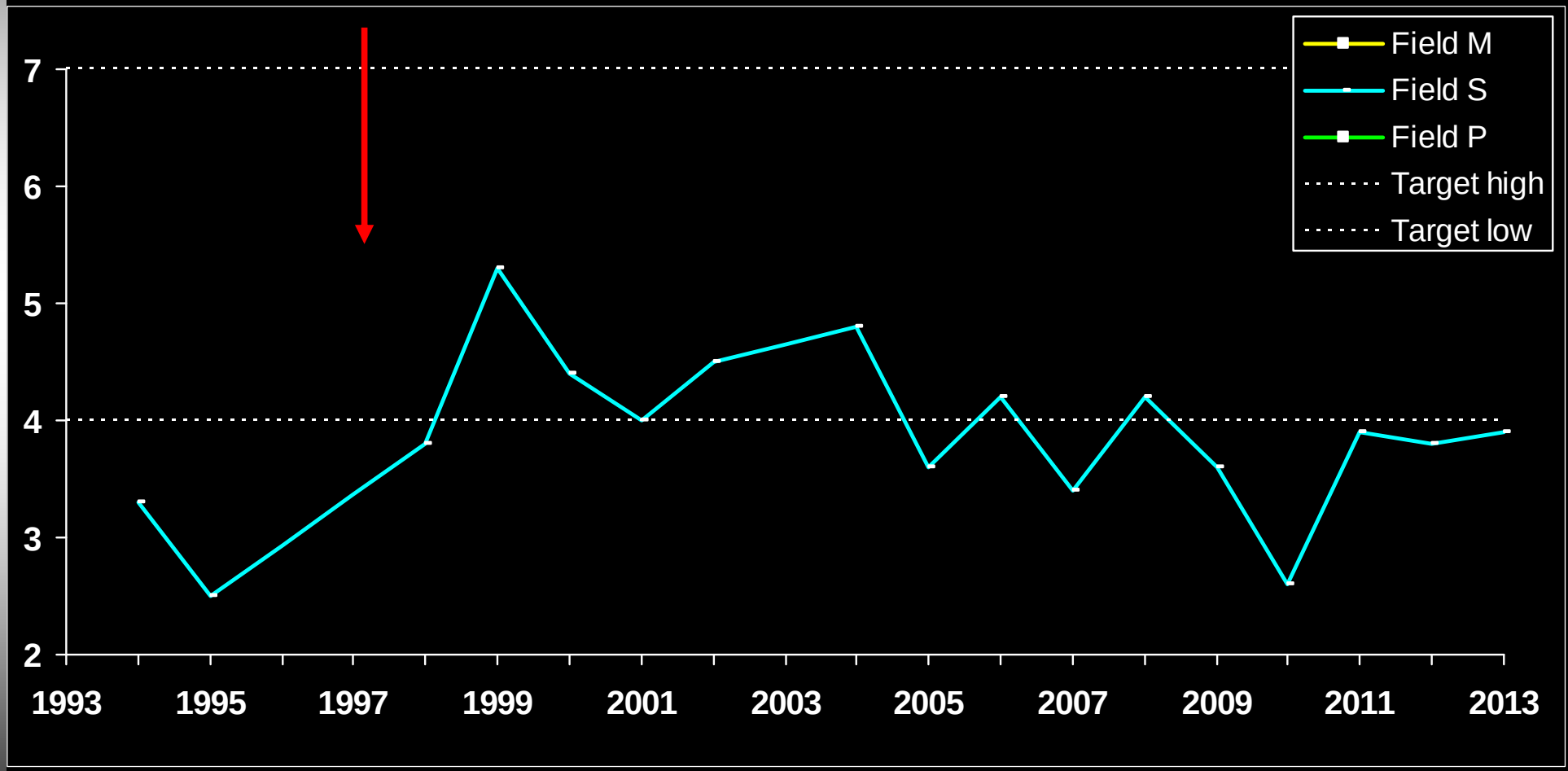

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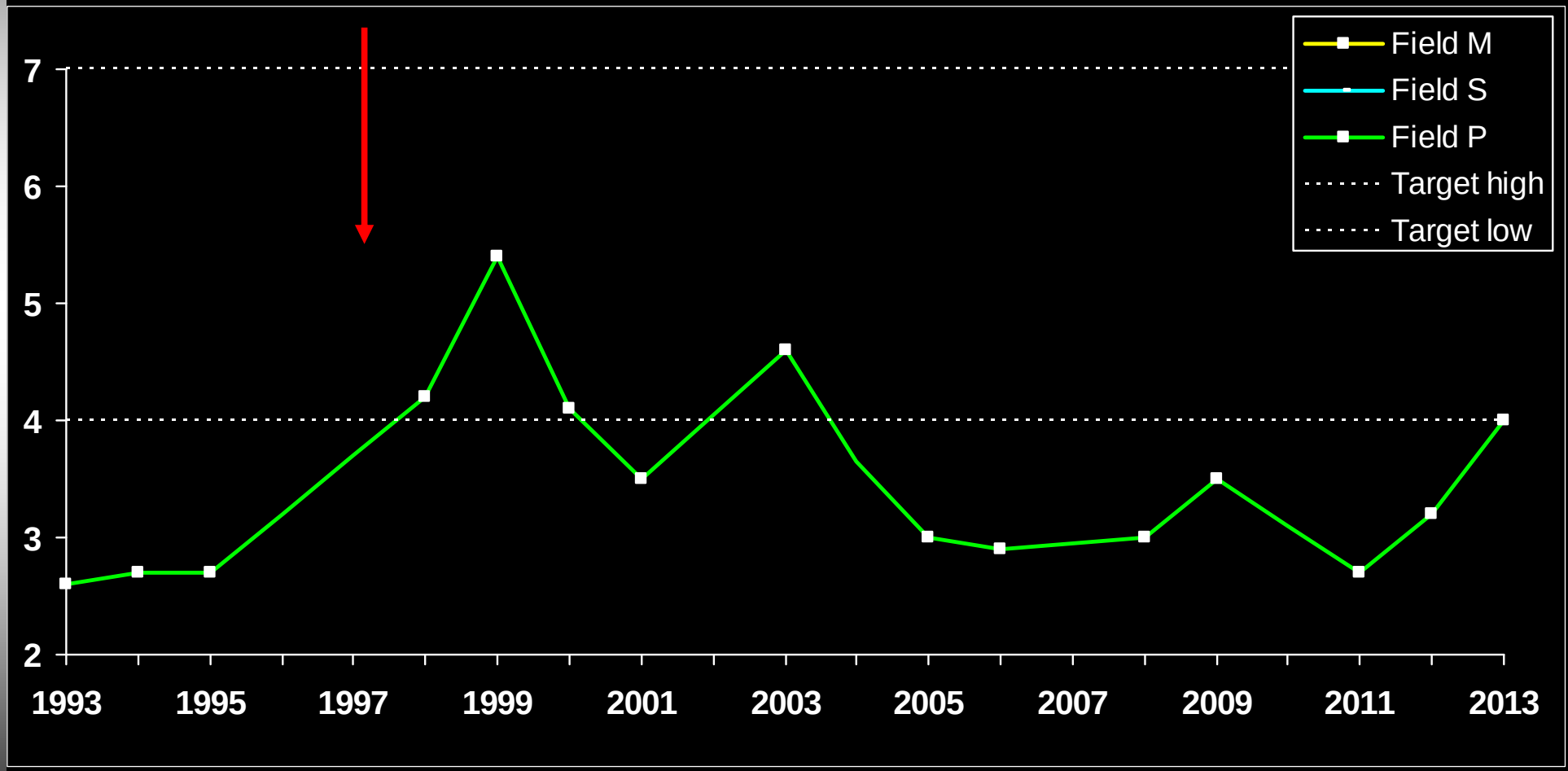

Soil organic matter in 3 different fields

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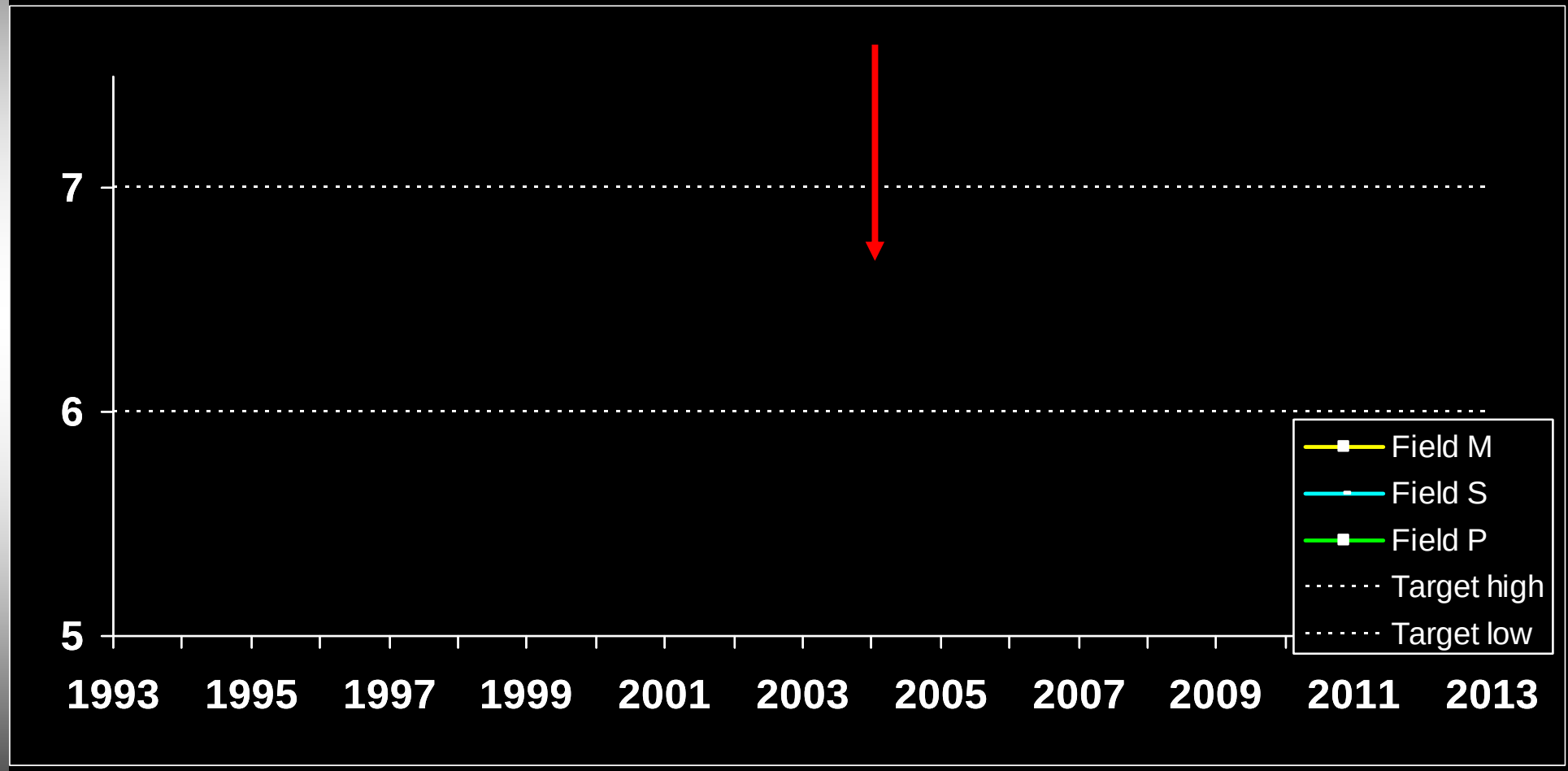
Compost applied since 1997 at 250 to 500 m^3 / ha / 2 years

Soil pH in 3 different fields

(Target is 6.0 to 7.0)

Dolomite lime annually until 2004 at 2.25 to 4.50 tonnes / ha



Soil pH in 3 different fields

(Target is 6.0 to 7.0)

Dolomite lime annually until 2004 at 2.25 to 4.50 tonnes / ha

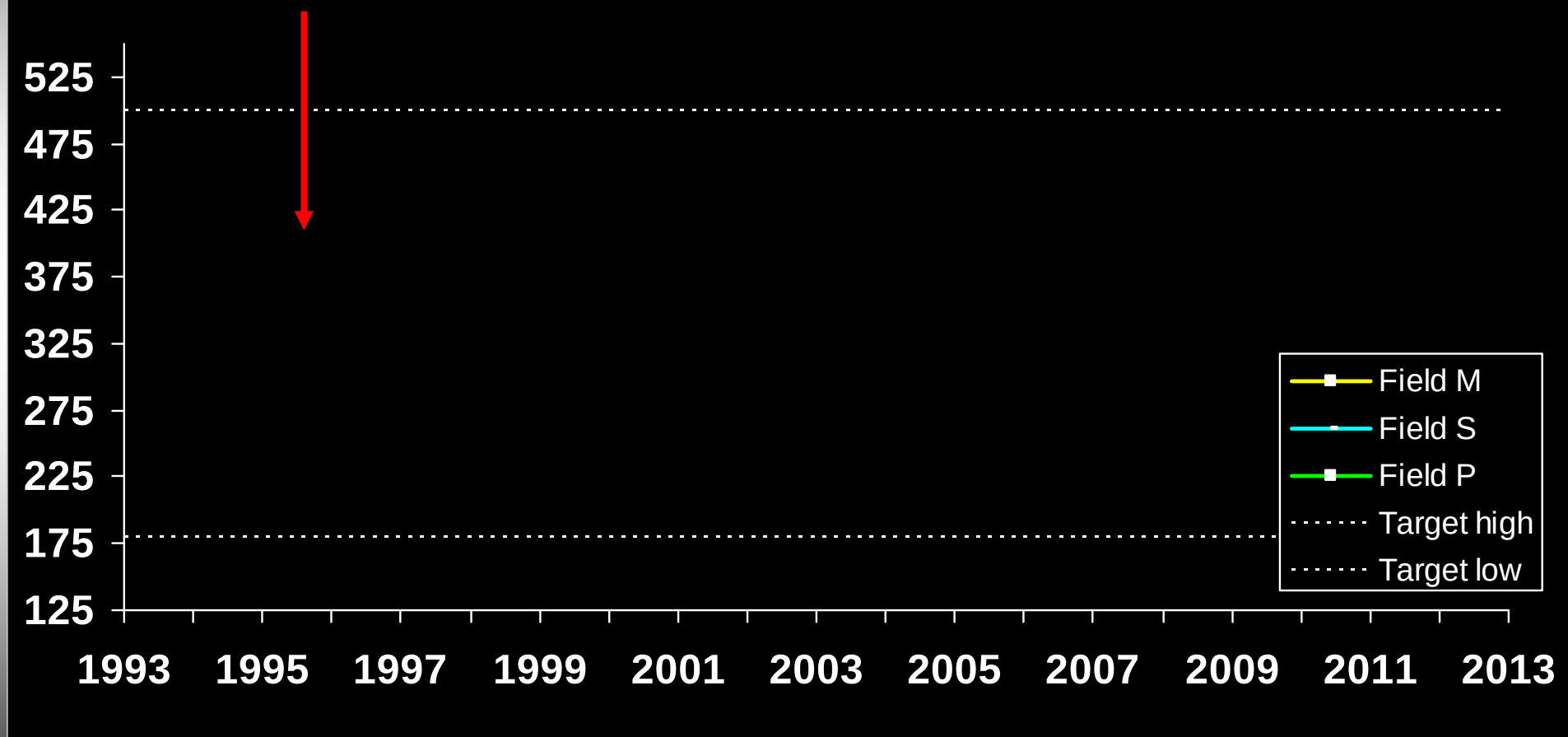
Nutrients in finished compost
(Griffin Laboratories, Kelowna and A&L Laboratories, Ontario)

	1996	1997	1998	1999	2012
pH	6.9	7.3	7.4	7.3	6.7
Organic matter (%)	27	36	37	40	20
Salt (dS/cm)	2.0	2.0	1.1	1.3	1.5
NO_3 (ppm)	56	12	11	19	63
P (ppm)	169	290	480	197	428
K (ppm)	913	1560	2985	1170	1813
B (ppm)	1.1	2.1	2.4	2.1	4.1
Fe (ppm)	123		98	103	351
Zn (ppm)	12	9	12	10	52

Soil potassium in 3 different fields

(Target is 180 to 500 ppm)

Potassium applied at 40 kg / ha until 1995



Soil potassium in 3 different fields

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Potassium applied at 40 kg / ha until 1995

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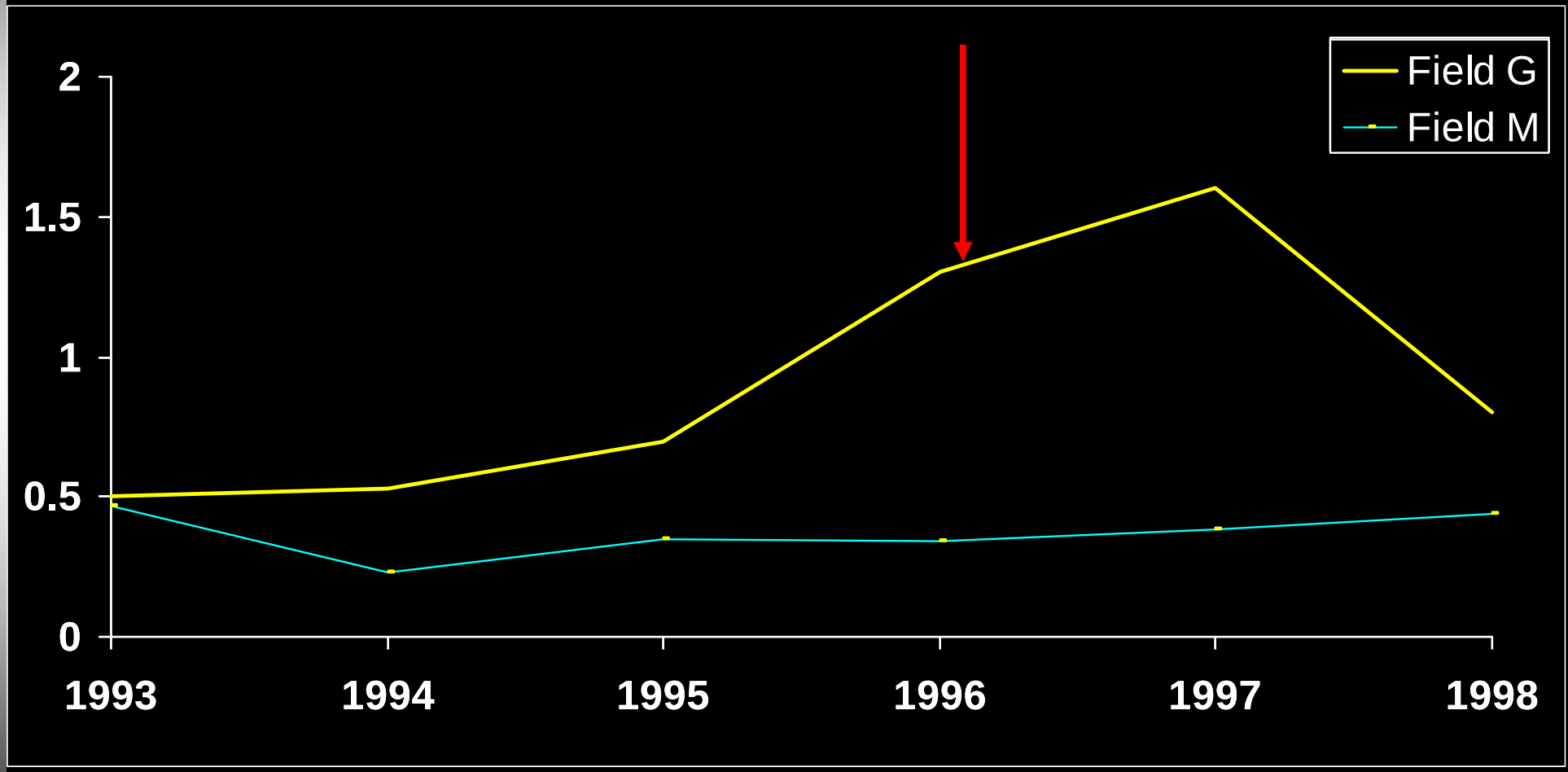
Challenge # 1: Manure based compost

Impact of manure applications on soil salinity

(Electrical Conductivity in dS/cm - Target is below 2.0)

Manure added to Field G in 1994, 1995 and 1996



Challenge # 2: Suppression of plant diseases
Adding compost helps alleviate *Agrobacterium*

Verticillium wilt remains a problem in fields amended with plant residue compost

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Compost is part of the potting media

25% plant compost + 75% conifer wood compost + fertilizers

Finished compost must be tested annually

% Porosity = % air space + % water holding

Testing porosity in potting media (2012)

Aeration porosity is critical for healthy roots in containers up to 27-cm

	# tests	Aeration	Water holding	Total porosity
20% nursery compost + 80% hog fuel				
20% nursery compost + 40% hog fuel + 40% coarse wood				
20% nursery compost + 40% hog + 40% fine				
Target for 15-cm container		*Over 25%*	*20 to 30%*	*Over 50%*

Testing porosity in potting media (2012)

Aeration porosity is critical for healthy roots in containers up to 27-cm

	# tests	Aeration	Water holding	Total porosity
20% nursery compost + 80% hog fuel	10	40	13	53
20% nursery compost + 40% hog fuel + 40% coarse wood	7	32	23	55
20% nursery compost + 40% hog + 40% fine	10	28	32	59
Target for 15-cm container		*Over 25%*	*20 to 30%*	*Over 50%*

Recall our temperatures in the compost pile

(°C at 1.2 meters deep, each point is the mean of 8 measures)

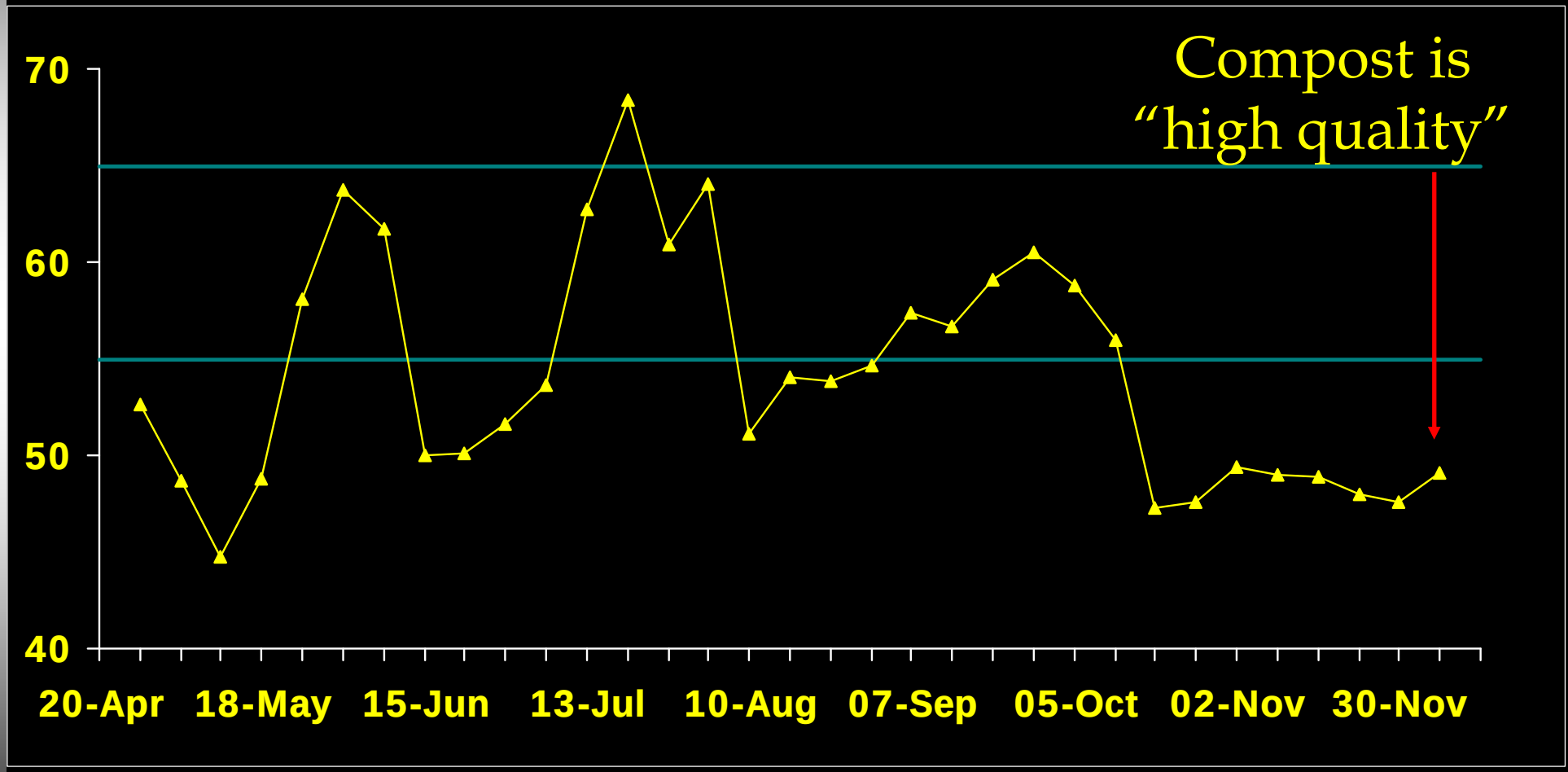

Plate with selective media

White: *Fusarium* Green: *Trichoderma* (native local sp.)

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Challenge # 1: Materials not properly stabilized

Unfinished compost leads to N immobilization
Also, it may still contain root rot pathogens

Plant in unfinished compost – Rotting roots
Selective media indicates *Pythium* infection

Root rot pathogens in different composts

(Propagules per gram of soil. Ribeiro Plant Lab, Washington)

	Phytophthora	Pythium	Rhizoctonia
Nursery compost			
Fir bark (year 1)			
Fir bark (year 2)			
Hemlock-fir compost (year 1)			
Hemlock-fir compost (year 2)			

Root rot pathogens in different composts

(Propagules per gram of soil. Ribeiro Plant Lab, Washington)

	Phytophthora	Pythium	Rhizoctonia
Nursery compost	0 (none)	60 (low)	0 (none)
Fir bark (year 1)	0 (none)	110 moderate	0 (none)
Fir bark (year 2)	0 (none)	0 (none)	0 (none)
Hemlock-fir compost (year 1)	0 (none)	0 (none)	0 (none)
Hemlock-fir compost (year 2)	0 (none)	410 very high	110 (moderate)

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Research topic # 1:
There is not enough compost for the whole field

Compost is applied in bands ahead of planting
Trees are grown for 3 years with compost bands

Trees excavated September 2013 (after 1 year)
Better root development in compost band

Research topic # 2:
Using compost tea as a natural fertilizer

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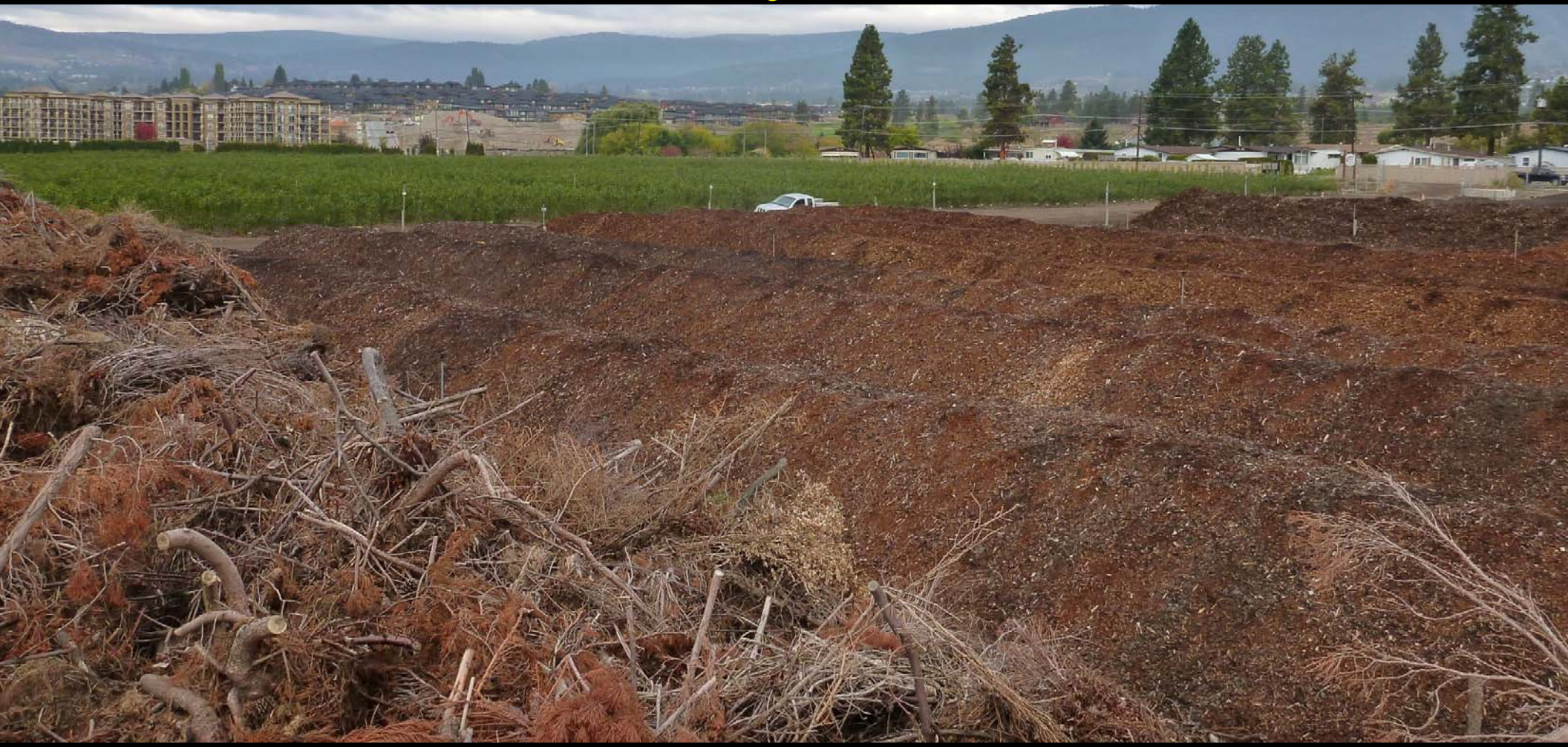

Thank you for your attention