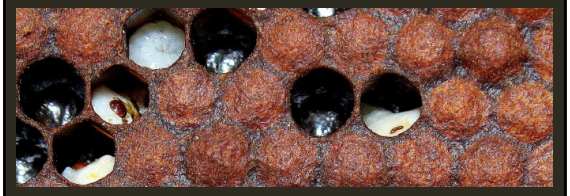
GOLDEN ERA OF BEEKEEPING

NEW ERA OF BEEKEEPING

LOCAL, NORTHERN TREATMENT FREE QUEENS – YEAR 1

FALL INSPECTION - DWINDLING, DYING COLONIES

DEATH BY VARROA/VIRUSES IS A TERRIBLE WAY TO GO.



https://beeinformed.org/2013/10/15/parasitic-mite-syndrome-pms/

BEES IN VARROA INFESTED COLONIES ARE PROFOUNDLY UNHEALTHY.

- Lower weights in adults and larvae
- Poor nutrition/higher food demand.
- Transmission of DWV
- Transmission of other viruses

Impacts of Varroa Parasitism on Honey Bee Health by Katherine Aronstein and Angela Douglas

IT WASN'T JUST ME

A HONEY BEE COLONY WITH VARROA, THAT IS NOT TREATED TO KILL THE PEST, WILL LIKELY DIE WITHIN ONE TO THREE YEARS (KORPELA ET AL. 1993; FRIES ET AL. 2006).

'LET DIE' APPROACH – EXPECT LOSSES OF 95%

Huges et al. 2012

PROBLEM 1: THIS IS NOT AN ETHICAL WAY TO TREAT ANIMALS

PROBLEM 2: VARROA-ASSOCIATED LOSSES ARE NOT SUSTAINABLE FOR BEEKEEPERS.

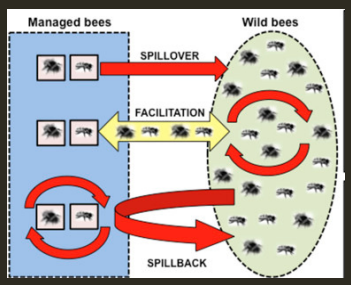
PROBLEM 3: WHEN WE LOSE COLONIES TO VARROA, IT AIDS IN TRANSMISSION OF DISEASE

TRANSMISSION OF DISEASE

Bees from colonies heavily infested with varroa drift more than bees from uninfested colonies (Schmid-Hempel 1998).

http://www.santacruzbees.com/wp-content/uploads/2015/07/Varroa_destructor_bee.jpg

TRANSMIT DISEASE TO NATIVE BEES



http://dx.doi.org/10.1016/j.jippaw.2015.10.001

LIVE AND LET DIE/ TREATMENT FREE/ NATURAL SELECTION/ BE CRUEL TO BE KIND

While started from a desire to have better bees, these methods are *seriously flawed*.

1) Unethical
2) Unsustainable
3) Increase spread of disease.
4) Theoretically impossible

WHY DO WE NEED TO BREED FOR RESISTANCE? *THE BEES AREN'T GOING TO GET THERE ON THEIR OWN**

1. Speed

We need to eat

WHY DO WE NEED TO BREED FOR RESISTANCE? *THE BEES AREN'T GOING TO GET THERE ON THEIR OWN**

2. Control of traits

Could be resistant to mites, but terrible for everything else

Getty Images/Image zoo/Adam Carruthers

WHY DO WE NEED TO BREED FOR RESISTANCE? *THE BEES AREN'T GOING TO GET THERE ON THEIR OWN**

3. Disease pressure

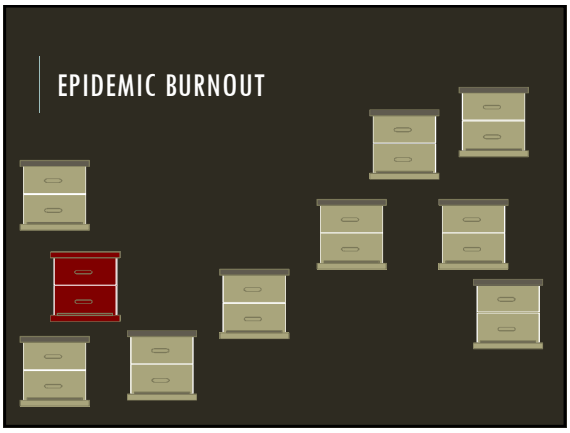
Most resistant traits work when there is a balance between the host and pest. If we let colonies die by 'natural selection,' you will lose a lot of good bees that would be fine once the epidemic is under control

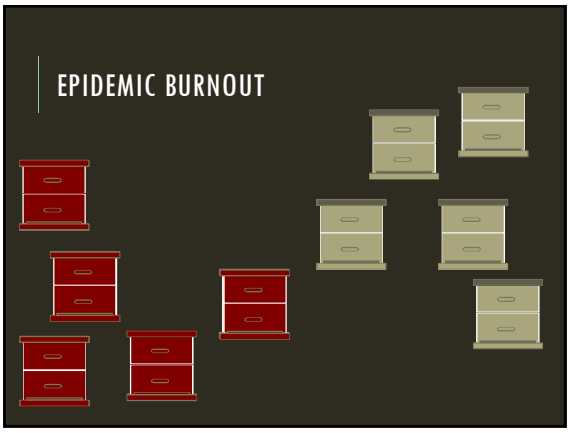
Varroa infestation – © Crown copyright 2010 "Courtesy The Food and Environment Research Agency (Fera), Crown Copyright"

WHY DO WE NEED TO BREED FOR RESISTANCE? *THE BEES AREN'T GOING TO GET THERE ON THEIR OWN**

4. Our movement/ replacement of bees does not allow for natural selection

It only works if you don't have constant immigration.


EPIDEMIC BURNOUT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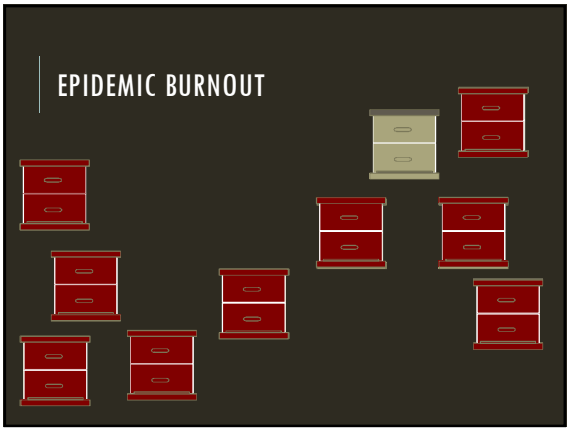
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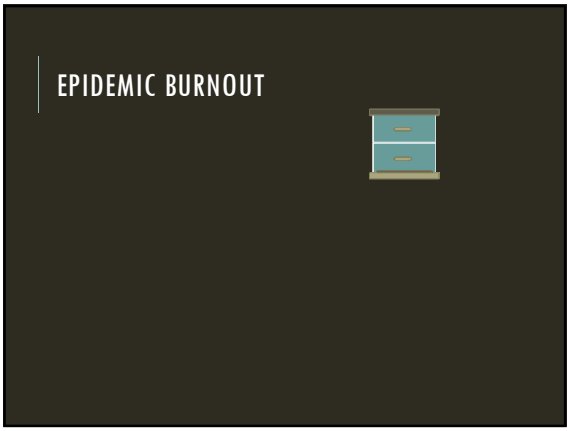
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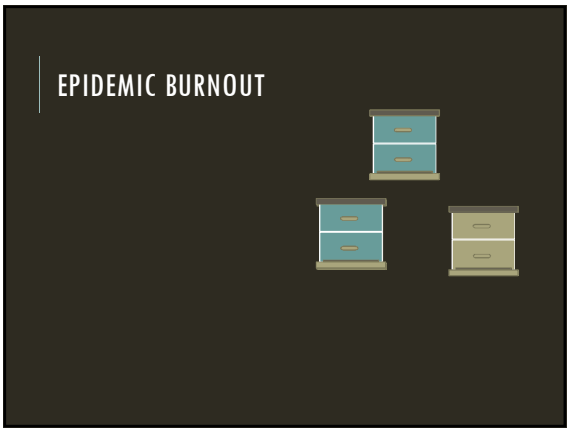
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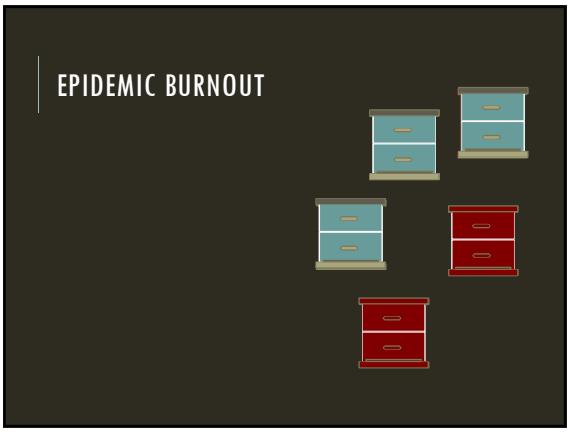
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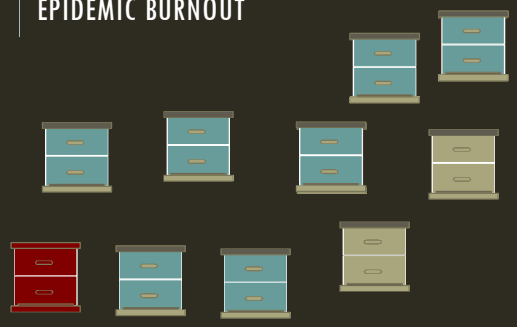

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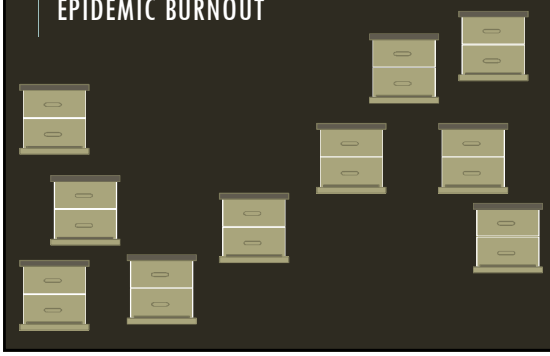
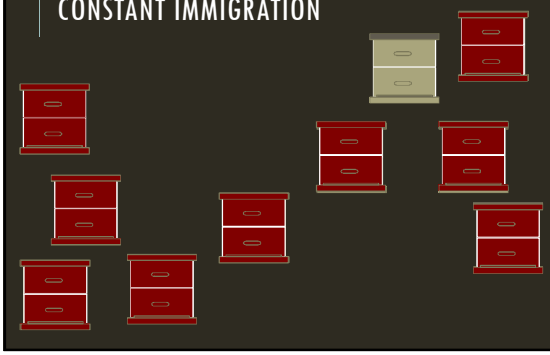


CONSTANT IMMIGRATION



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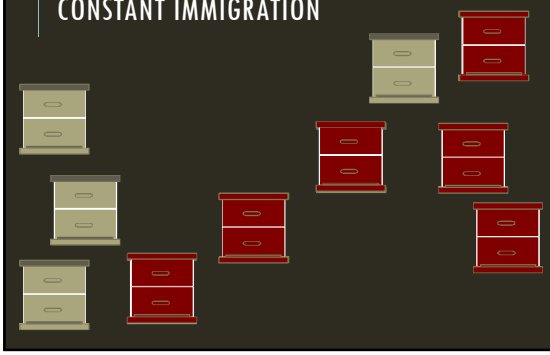

VARROA MITES ARE TERRIBLE AND EVERYWHERE.

IT IS IMPOSSIBLE TO LET NATURAL SELECTION TAKE ITS COURSE IN REALITY – WE HAVE CONSTANT MIGRATION OF BEES, IT WILL TAKE TOO LONG, AND MOST LIKELY WON'T RESULT IN THE BEES THAT WE WANT.

WE NEED TO ACTIVELY BREED FOR GOOD BEES THAT ARE RESISTANT FOR VARROA.

A BETTER WAY

- Ethics of animals in human care
- Disease transmission
- Unsustainable

- Not get caught on a treadmill of constant chemical inputs.

GOAL = HEALTHY BEES.
LITTLE INTERVENTION *AND* LITTLE LOSS

WE ARE IN THE MIDDLE OF AN EPIDEMIC

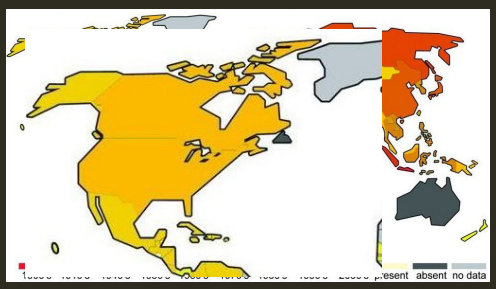

Image: science.sciencemag.org

IF YOU ARE A BEEKEEPER IN THE UNITED STATES IN 2018, YOUR COLONIES WILL HAVE VARROA MITES, AND WILL BE AT RISK*.

** Except some Hawaiian islands*

IN ORDER TO SUCCESSFULLY BEAT AN EPIDEMIC, WE NEED TO DECOUPLE BREEDING FROM MANAGEMENT.

(Letting bees die from varroa is not a breeding strategy)

SOME CONTEXT – NOT OUR FIRST EPIDEMIC

Tracheal mites

AFB

Varroa

?????

Ken Walker Museum Victoria

WE BEAT EPIDEMICS BY CONTROLLING THE SPREAD OF DISEASE, WHILE WORKING ON PERMANENT RESISTANCE.

1) STRATEGIES THAT WE CAN USE TO REDUCE VARROA
EPIDEMIC MITIGATION
SHORT TERM

2) STRATEGIES THAT THE BEES USE TO REDUCE VARROA
GENETIC ADVANCEMENT
LONG TERM

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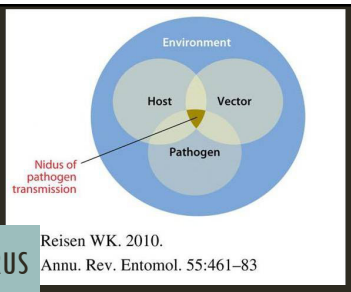

Reisen WK. 2010.
Annu. Rev. Entomol. 55:461–83

THE VARROA-VIRUS LANDSCAPE IS COMPLEX AND HETEROGENEOUS.

cmr.asm.org

MY NEIGHBOR/MENTOR/FRIEND/GRANDPA DON'T TREAT, AND THEIR BEES LIVE FOR 1200 YEARS

http://www.moranandangel.com/2012/05/21/10-things-lucky-people-do-differently/

1) They may be in an area with very little pressure (no vectors)

2) They may be in an area with no virus

3) They may have a weakened version of varroa

4) They may have a weakened version of the viruses

5) They may swarm all the time

6) They may do other things that control mites that are treatments

They may take huge losses.

THE AMOUNT OF WORK YOU HAVE TO DO TO KEEP YOUR BEES HEALTHY DEPENDS ON THE DISEASE PRESSURE IN YOUR AREA.

It is not about 'treat' or 'didn't treat' – it is whether or not the animals under your care are kept safe from disease.

YOUR JOB AS A BEEKEEPER IS TO KEEP YOUR BEES HEALTHY.

HAVE A PLAN AT THE BEGINNING OF THE SEASON TO MANAGE VARROA MITES, AND TO MAKE VARROA MITE MANAGEMENT A REGULAR PART OF YOUR HONEY BEE MANAGEMENT.

WHY DO WE NEED TO BREED FOR RESISTANCE?
WE HAVE LOW COMPLIANCE FOR MANAGING DISEASE

(Even if we had a silver bullet, not everyone would use it)

WE BEAT EPIDEMICS BY CONTROLLING THE SPREAD OF DISEASE, WHILE WORKING ON PERMANENT RESISTANCE.

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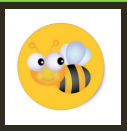
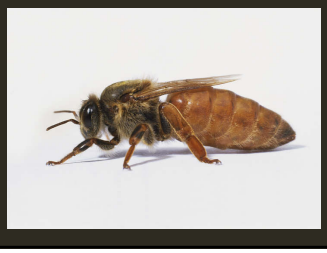
EPIDEMIC MITIGATION
SHORT TERM



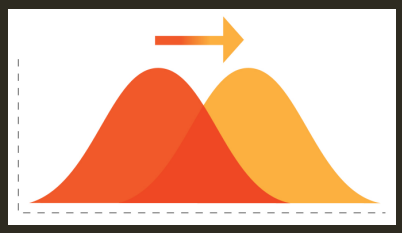
2) STRATEGIES THAT THE BEES USE TO REDUCE VARROA
GENETIC ADVANCEMENT
LONG TERM

WHY DO WE NEED TO BREED FOR RESISTANCE?
BREEDING IS THE ONLY LONG-TERM SOLUTION

WE NEED VARROA RESISTANT STOCK
1. WITHOUT KILLING OUR BEES
2. WITHOUT PUTTING OTHER BEES AT RISK



BREEDING



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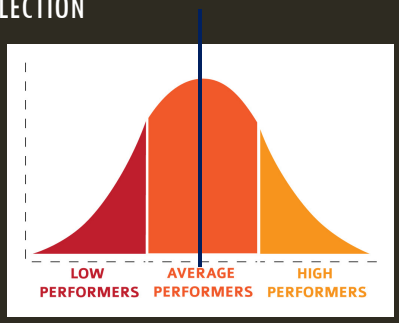

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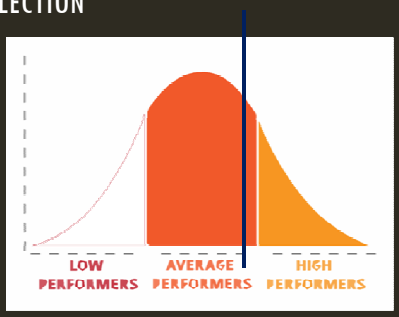
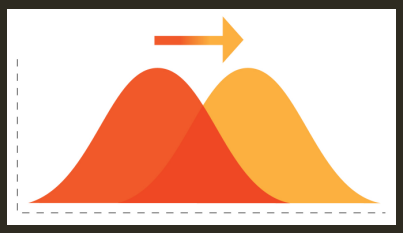
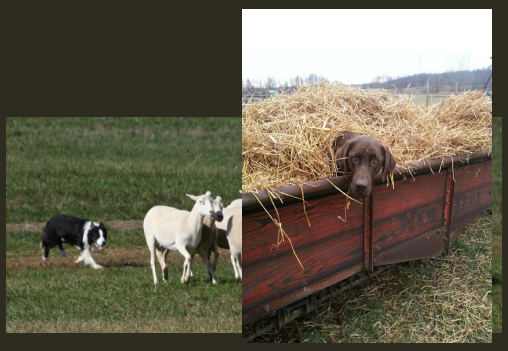


Photo: Charles Lam

BREEDING





BREEDING INVOLVES SELECTING TRAITS AND CROSSING BEES THAT EXPRESS THOSE TRAITS

SOME BEHAVIORS ARE DIFFICULT TO BREED FOR OR TEST

Table 1. Duration of the life cycle (days) of different castes of *A. cerana* and *A. mellifera* (modified from Oldroyd & Wongsiri, 2006)

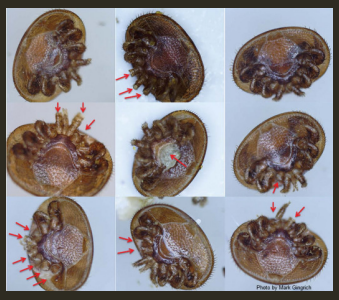
Stage	Worker		Drone		Queen	
	A. cerana	*A. mellifera*	*A. cerana*	*A. mellifera*	*A. cerana*	*A. mellifera*
Egg to larva	3	3	3	3	3	3
Larva to pupa	5	6	6	7	4-5.5	5
Pupa to adult	11	12	14	14	6-7.5	5
Total	19	21	23	24	13-16	13

SOME BEHAVIORS ARE NOT IDEAL

WHAT BEHAVIORS DO WE HAVE TO WORK WITH?

1. Grooming behavior
2. Infested worker brood removal
3. Virus resistance

WHAT DOES RESISTANCE LOOK LIKE? - GROOMING

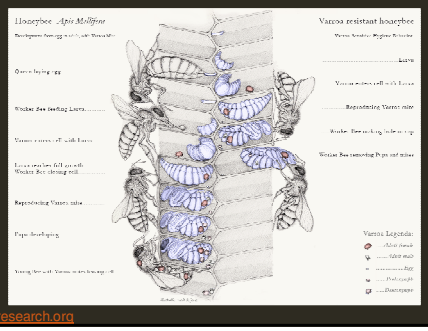


VARROA CAMOUFLAGES ITS SCENT IN THE COLONY

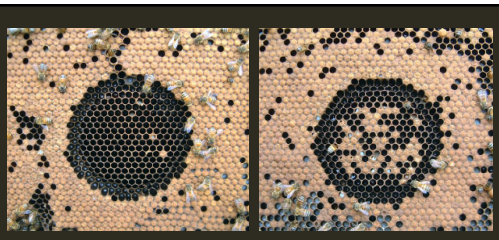
Regular Colony

Mite Biter Colony

WHAT DOES RESISTANCE LOOK LIKE? - VSH

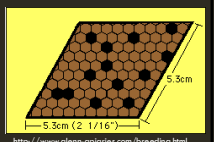


aristabeeresearch.org

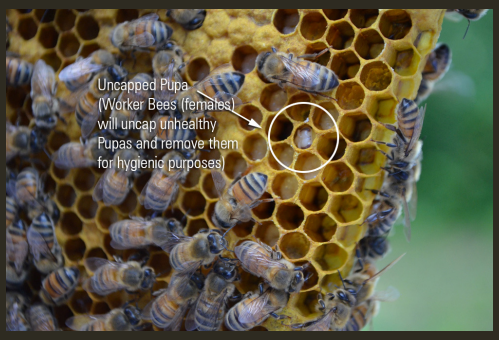


https://beeinformed.org/2011/07/25/hygienic-behavior/

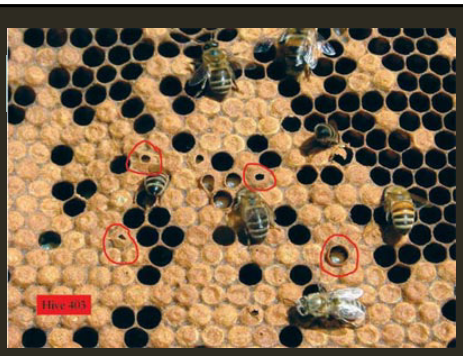
https://www.youtube.com/watch?time_continue=2&v=NdFjqVwwylk



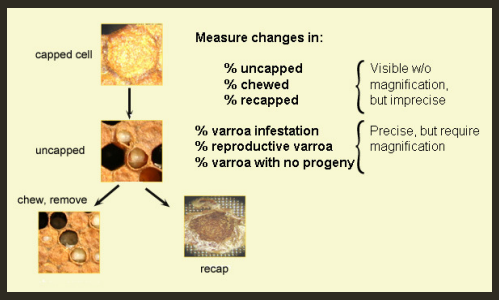
http://www.glenn-apiaries.com/breeding.html

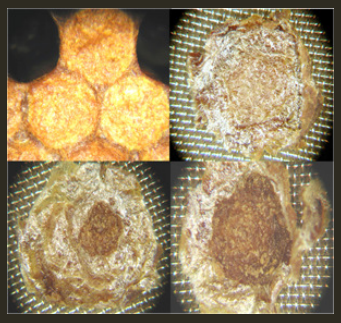


https://promisedlandhoney.wordpress.com/2015/06/21/unpacking-bee-jargon/

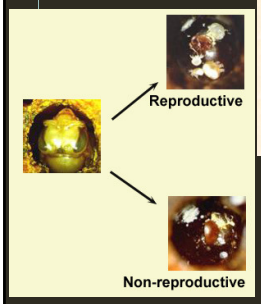


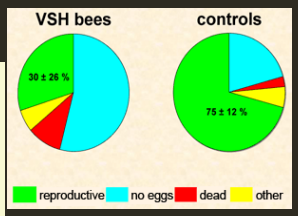
http://dencor.ca/BC88A/index7d5f.htm#page_id=144





http://articles.extension.org/pages/30361/varroa-sensitive-hygiene-and-mite-reproduction





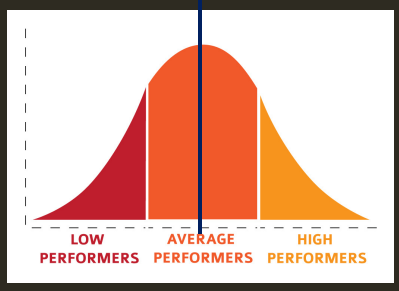
http://articles.extension.org/pages/30361/varroa-sensitive-hygiene-and-mite-reproduction

MONITOR FOR HYGIENIC BEHAVIOR

1. Assay
   - Liquid Nitrogen
   - Pins
2. Spotty brood
3. Chewed pupae
4. Clean bottom boards
5. Uncapping
6. Mite populations

BREEDING – INSEMINATION / GENE SELECTION

SELECTION



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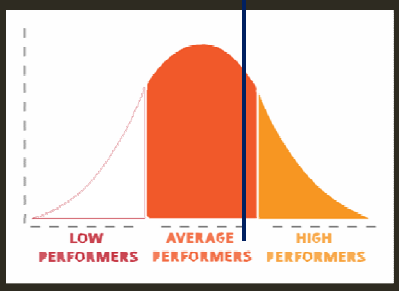


LIVE AND GET BETTER BEES METHOD

MOVING TOWARDS TREATMENT FREE – STOCK SELECTION

- You are using chemicals when you have to, but aren't committing to constant use.
- We are finding the strongest colonies through monitoring (not through mass death).

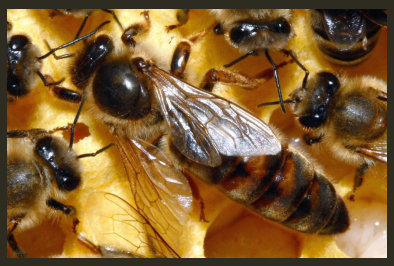
http://articles.extension.org/pages/30361/varroa-sensitive-hygiene-and-mite-reproduction

SET YOUR CRITERIA

1. Manage varroa populations
2. Honey production
3. Defensiveness
4. Behavior on frames
5. Shut down of brood rearing
6. Quiet cluster
7. Color
8. ??????????

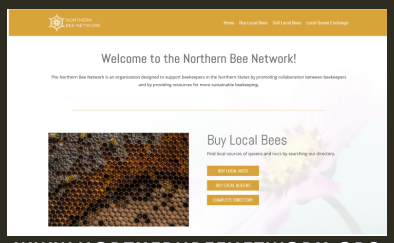
FIND THE BEES THAT ARE THE BEST BY YOUR CRITERIA

BREED OFF OF YOUR BEST COLONIES, REPLACE QUEENS IN THE ONES THAT AREN'T AS GOOD.



WHERE DO I GET MY NEW QUEENS? – YOUR BEST COLONY (OR YOUR NEIGHBORS)

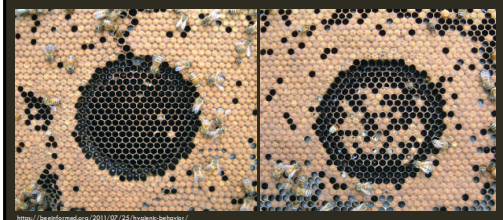
WHERE DO I GET NEW QUEENS?



WWW.NORTHERNBEENETWORK.ORG

WHERE DO I GET MY NEW QUEENS?

Queen breeder selling VSH, Mite Biter, Pol-Line, Russian etc.



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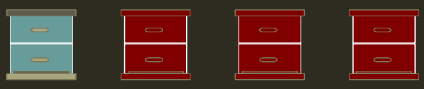
MOVING TOWARDS TREATMENT FREE

Year 1.
Get bee hives.

MOVING TOWARDS TREATMENT FREE

Year 1.
Get bee hives.

Monitor for Varroa.

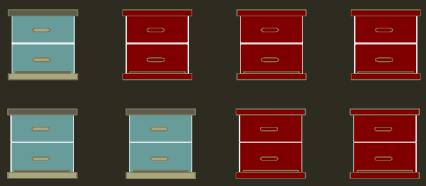


MOVING TOWARDS TREATMENT FREE

Year 1.
Get bee hives.

Monitor for Varroa.

Treat those hives that have high levels, and replace with new queens



MOVING TOWARDS TREATMENT FREE

Year 1.
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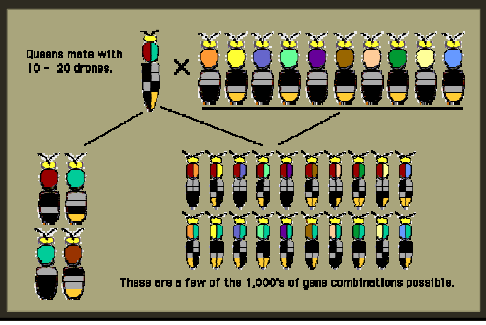
GENETICS CHANGE COMPLETELY EACH TIME THE QUEEN IS REPLACED.



IDEALLY – WHEN YOUR NEW QUEEN GOES OUT TO MATE – ALL THE DRONES HAVE BETTER GENETICS

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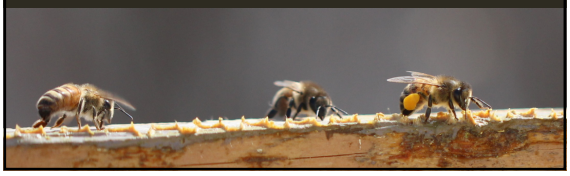
- *Very few people can do breeding programs*
- *Many people can do stock selection*
- *If you aren't set up to do stock selection or breeding, then at least do your part to manage the epidemic and keep the bees healthy*
- *Buy bees from people who are doing the work.*

TOGETHER WE CAN STOP THE VARROA EPIDEMIC

1) STOPPING THE SPREAD OF THE VECTOR

2) INCREASING BEES WITH MITE RESISTANCE GENES.



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CRITERIA

In / Out

- Presence of disease (EFB, AFB, Nosema)
- Poor behavior on the frames (runny bees)
- Highly defensive

Quantitative

- Honey production
- Varroa counts
- Hygienic behavior

Qualitative

- Quiet cluster
- Shut down of brood during dearth
- Spring build up

You like it / gut instinct

EXAMPLE OF A HIVE MONITORING CHART

Trait	Criteria	Grade
Varroa	Mites/ 100	
Honey Production	Supers removed (to .1)	
Defensiveness	1 - 5	
Nucs removed	1 - 5	
Frames of brood in Oct		

EXAMPLE 1: NEW HIVE, HEAVY DISEASE PRESSURE

Month	Action
April	- Apply oxalic acid by drench 1 week after queen is released
May	- Monitor
June	- Apply Hop Guard 2
July	- Monitor - Apply Apiguard or Api Life Var
August	- Monitor - Apply MAQS if above threshold
September	- Monitor - Apply MAQS if above threshold
October	- Oxalic acid

EXAMPLE 2: NEW HIVE, LIGHT DISEASE PRESSURE

Month	Action
April	- Apply oxalic acid by drench 1 week after queen is released
May	- Monitor
June	- Monitor
July	- Monitor - Apply fully MAQS
August	- Monitor - Apply MAQS if above threshold
September	- Monitor - Apply MAQS if above threshold
October	- Oxalic acid

EXAMPLE 3: OVERWINTERED HIVE, HEAVY DISEASE PRESSURE

Month	Action
April	
May	- Perform walk away splits - Monitor
June	- Apply ½ MAQS Treatment - Monitor
July	- Monitor - Remove honey at end of month - Apply Api guard
August	- Monitor - Apply MAQS if above threshold
September	- Monitor - Apply MAQS if above threshold
October	- Oxalic acid

EXAMPLE 4: OVERWINTERED HIVE, LIGHT DISEASE PRESSURE

Month	Action
April	
May	- Perform walk away splits - Monitor
June	- Drone brood removal - Monitor
July	- Drone brood removal - Monitor
August	- Monitor - Apply MAQS if above threshold
September	- Monitor - Apply MAQS if above threshold
October	- Oxalic acid

EXAMPLE 5: OVERWINTERED HIVE, LIGHT DISEASE PRESSURE, EXPERIENCED BEEKEEPER

Month	Action
April	
May	
June	
July	- Create splits with cells - Apply oxalic acid via drench
August	- Monitor - Apply MAQS if above threshold
September	- Monitor - Apply MAQS if above threshold
October	- Oxalic acid