

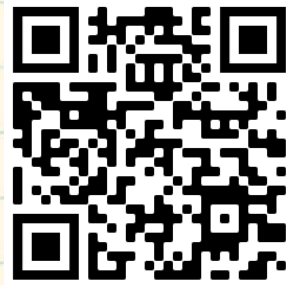
# WE NEED YOUR HELP!



We are glad to provide these materials for free. In order for us to continue receiving funding for new materials, we need to collect information on how they are used.

**Thank you for taking the time to answer the following one-minute survey.**

There are three ways to complete the survey:



- 1** Scan this code with your smartphone camera
- 2** Type the following link into your web browser:  
<https://plantheroes.org/educator-survey>
- 3** Email your answers to:  
[plantheroes@publicgardens.org](mailto:plantheroes@publicgardens.org)



- 1) Job title
- 2) Name of organization you belong to
- 3) What kind of educator are you?
  - Teacher
  - Summer camp counselor
  - Home schooler
  - Public garden educator
  - Informal educator
  - Other (please describe)
- 4) What grade level do you teach?
  - Elementary (K-5)
  - Middle School (6-8)
  - High School (9-12)
  - Other (please describe)
- 5) Specify what subject area you teach:
  - Science
  - Math
  - Language Arts
  - Social Studies
  - Other (please describe)
- 6) How many students do you teach in a school year?



Help the Plant Heroes protect our forests  
by slowing the spread of pests and diseases!

# INSECT | WHITE PINE BLISTER RUST

PLANTHEROES.ORG  
ADVANCED  
ACTIVITY  
BOOK

**Nate Green**



**BE A PLANT HERO!**  
Help Nate slow the  
spread of White Pine  
Blister Rust!



Plant  
Protection  
Program

AMERICAN PUBLIC GARDENS ASSOCIATION

# A 'CURRANT' THREAT



Nate and his parents spent winter break with his older sister, Karen, at her new home near Salt Lake City, Utah. They spent a bunch of time on the slopes and the snow was awesome!

Several months later they are getting ready for another visit ...

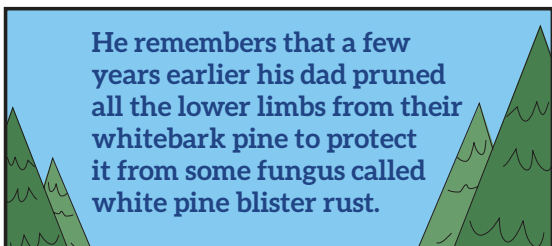
Nate's mom suggests that he dig up a few small black currant bushes from the backyard and bring them to Karen for her garden.



When Nate starts digging up the currant plants the next day, he notices that a lot of leaves are covered in orange spots.



He remembers that a few years earlier his dad pruned all the lower limbs from their whitebark pine to protect it from some fungus called white pine blister rust.



## HANG ON!!

What was the funny name of those pines I didn't recognize at Karen's last winter... limber pine? Is that some kind of white pine?



He looks it up on his phone and learns that all white pines have needles in bundles of five and that limber pine is in that group.

Nate texts his sister:



The pictures arrive and Nate was right ...

**FIVE NEEDLES!!**

“MOM! If we bring these plants, we might infect her pines with a deadly disease! Maybe we should find something else for her while we’re there.”



They wait, and, sure enough, they find a native plant nursery in Salt Lake City that specializes in edibles. The owner explains that white pine blister rust hasn’t been found in Utah yet, and they hope it never is.



He helps them pick out some choke-cherry and elder-berry bushes for Karen’s place and even sends them home with some samples of their fruit.



They put the plans in the ground that afternoon and then do some celebrating in the kitchen. Maybe it’s knowing that they weren’t the ones to introduce white pine blister rust to Utah, but everyone agrees, Karen’s scones taste extra sweet today!

The Plant Heroes are brought to you by the American Public Gardens Association. This comic was developed with financial support from the USDA – Animal and Plant Health Inspection Service and reproduced with financial support from the USDA – Forest Service. Play games and learn how you can protect plants at [plantheroes.org](http://plantheroes.org).

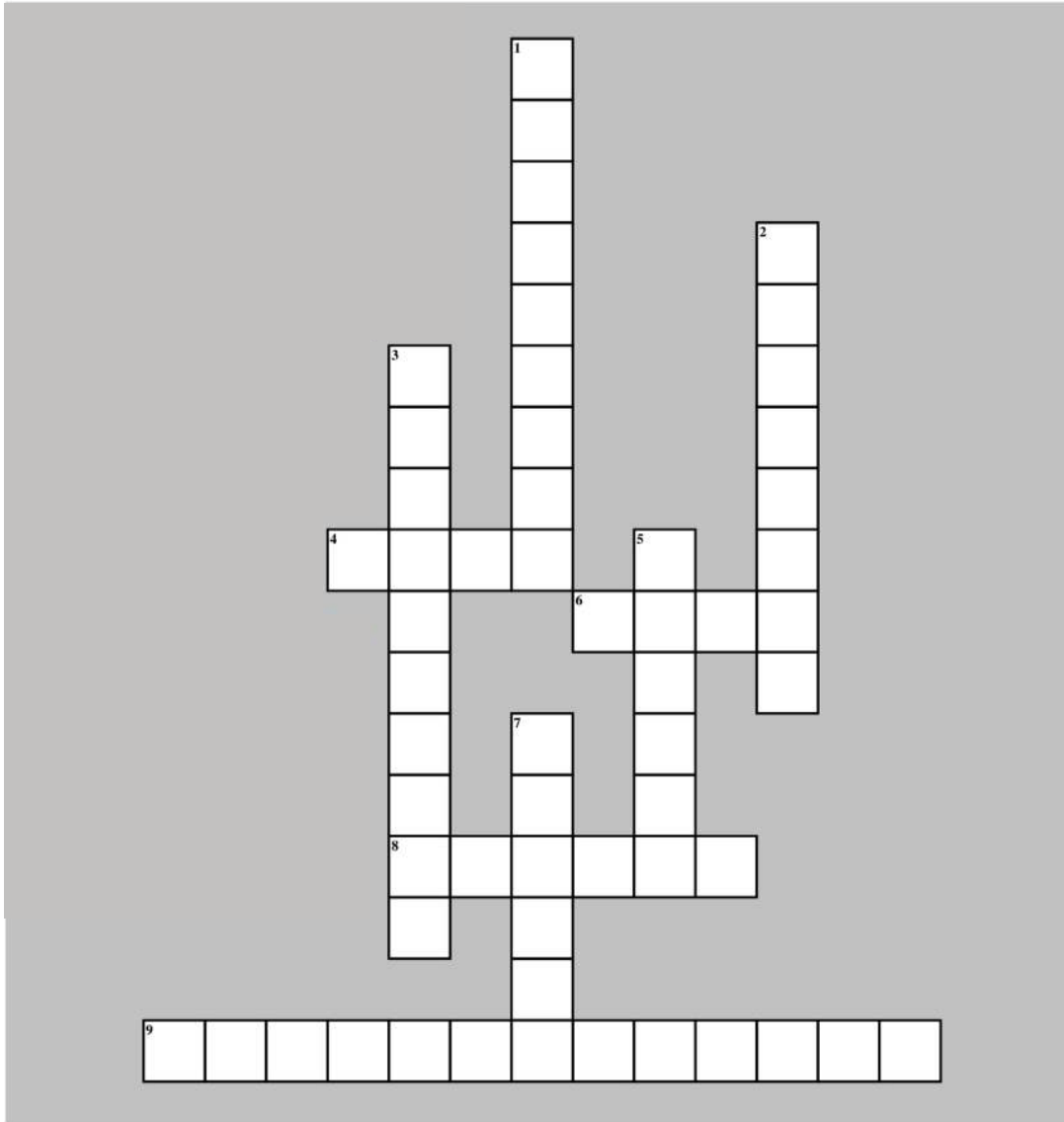




Name \_\_\_\_\_

Date \_\_\_\_\_

**Complete the white pine blister rust crossword puzzle.  
Look on the next page for word clues!**



**FIVE  
GIRDLE  
FUNGUS**

**CANKER  
REFORESTATION  
ALTERNATE**

**PINE  
RESISTANCE  
PATHOGEN**



**GAMES!**

Learn more and test your knowledge with interactive games on [plantheroes.org](http://plantheroes.org)

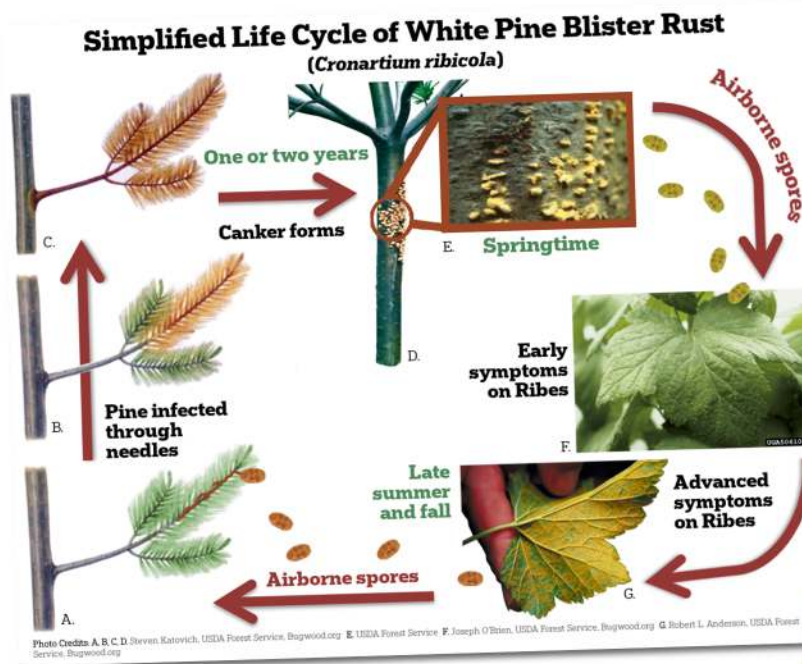
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## ACROSS

- 4 Pines that are infected by white pine blister rust have \_\_\_\_\_ needles.
- 6 An evergreen tree that has cones and leaves that look like needles.
- 8 A defined area (often sunken or discolored) that is diseased or has been killed by a pathogen, especially on a woody stem. Those caused by white pine blister rust have a border of white or orange "blisters" that contain spores of the pathogen.
- 9 The process of planting new trees in places where the original forest has been cut down or destroyed by fire, disease, or insects.

## DOWN

- 1 To go back and forth between two different types of host plants. The white pine blister rust pathogen does this between Ribes and pines.
- 2 A tiny living thing that causes disease such as viruses, bacteria, and other germs.
- 3 The natural ability of an organism to fight off pests or pathogens or be less damaged by them.
- 5 To cut away or kill the living tissue in a ring around a plant's branch or stem, often causing it to die.
- 7 One of a large group of living things that are similar to plants but cannot make their own food using sunlight. They can cause diseases in plants and animals, but they also help decompose dead material and include mushrooms, yeasts, and molds.



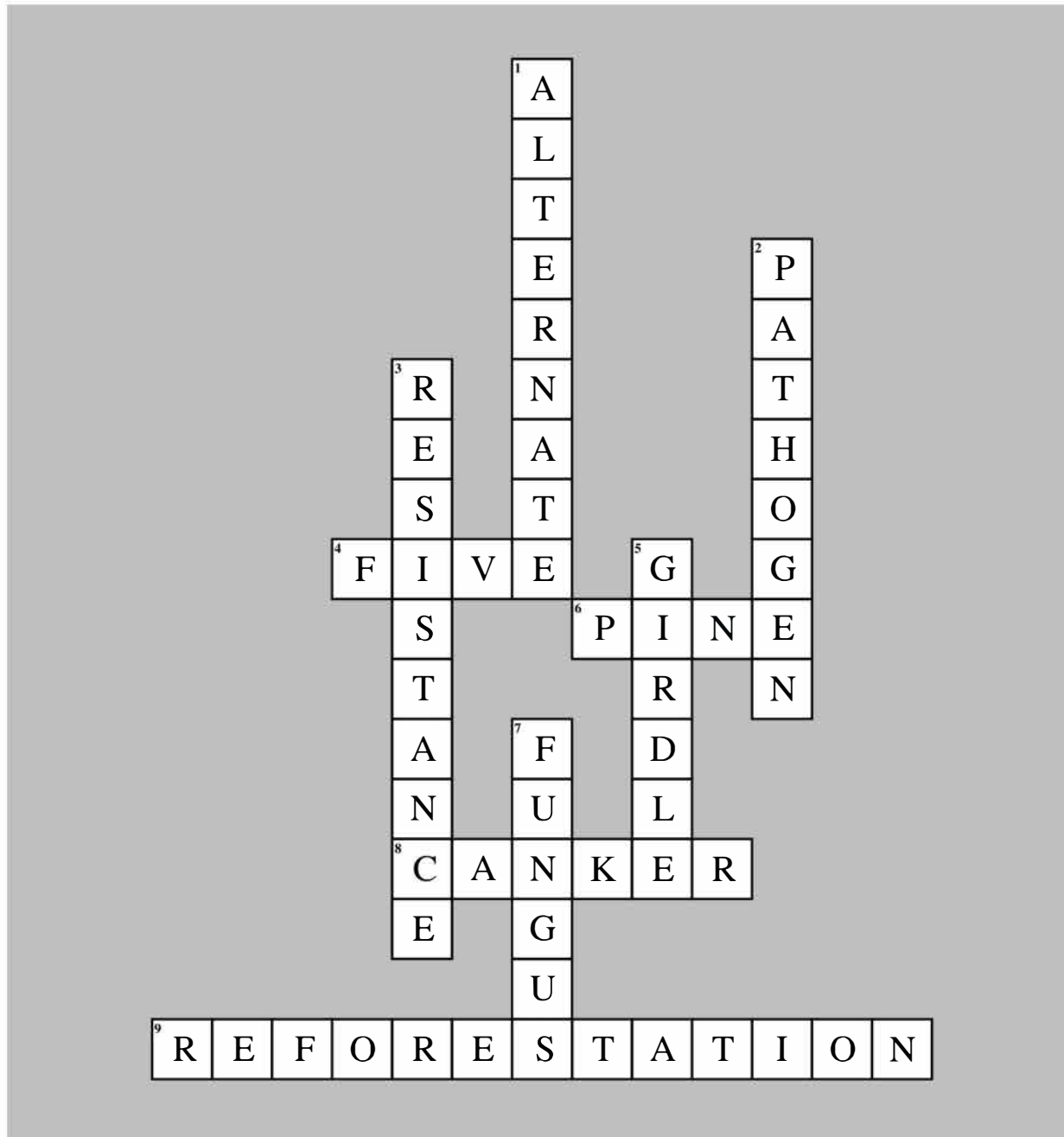
### << **Weird Fact:**

The fungus that causes white pine blister rust, *Cronartium ribicola*, needs to infect a plant in the Ribes genus to complete its life cycle and before it can infect a pine tree.

On Ribes, the alternate host, *C. ribicola* only causes minor damage to the leaves.



## Answer Key





Name \_\_\_\_\_

Date \_\_\_\_\_

# White Pine Blister Rust

Complete the maze and then find the words. The words can only be found along your maze path.

START  
▼

```

XELAQLSUR   OEVFWMLJTTMTUYXHAFNDHSFXCOEKKNDXVWWQWCUTUSUAWHJOR
R              Y              S              P      Q
J              K              G              E      I
A              I              W              B      C
A    L    EJNJTNSAI    V    PRIIW    E    XKAHLCCMVNXSYXRLEPPPX    V
T    U    U    X    X    P    X    S              T      A
V    N    X    U    T    Y    Y    Q              I      T
G    P    N    H    W    K    Y    N              C      S
T    AESXY    M    M    JWGXM    B    X    FEDULIXWW    BBIFM    Y    D
D    H    T              Q    C              I      G    X
M    P    D              K    B              O              V    H
N    C    D              M    T              V              U    T
FSYJW    WCGJN    SGRSWSSPECIESKQTCOKGFAMI    EWKGM    KHKPM    J
I          U    O    X              W    Y    C    P    A
N          B    V    H              Y    F    X    P    U
F          I    C    U              L    Y    V    G    H
E    RSSGA    KDUDI    W    ERADICATE    EXOUKBMOE    B    D    O    M
C          C    W    H    N    D    X    T    T    R
T          U    Q    D    O    N    Q    B    C    A
F          R    B    I    R    G    U    H    N    E
PCYOH    REFORESTATION    SYQMD    LRLORANGE    S    B    K    S    O
D          A    S    E    Q    G    C    T    P    V
M          N    S    A    M    S    C    R    M    Y
I          T    G    S    O    H    Y    B    Y    A
T    HOSTG    SYHGV    I    E    P    C    R    VFEUH    ONGURIPGR    Y
V          B    P    U    B
Q          U    G    B    Y
D          K    C    L    I
UODBFCANKERATKXDICOHVEKBUGLRIKEFHGEGWJJRK    FLEOMKCVNDGACHBWQ

```

END  
▼

Find and circle these words:

**HOST  
DISEASE  
CURRANT**

**CANKER  
SPECIES  
INFECT**

**ERADICATE  
REFORESTATION  
ORANGE  
SHRUB**



## GAMES!

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Name \_\_\_\_\_

Date \_\_\_\_\_

Find each of the following words.

**SHRUB  
CURRANT  
INFECT**

**ORANGE  
ERADICATE  
CANKER**

**REFORESTATION  
SPECIES  
DISEASE**

**HOST  
GOOSEBERRY  
RIBES**

E Y O G S H R U B F Y N E O S N R I B B  
 S O A E E R E R R N I K R E R I B E S A  
 R I E F A E R T E R G O O S E B E R C N  
 E R A H H Y I D E I E T E E C R E S R G  
 F U R S C R E F O R E S T A T A A S C S  
 O S O O U E R A D I C A T E Y E N H S R  
 R A H Y R U R R O E R C R R E A E K R E  
 E F F E I A S N E A C B R G C T Y F E N  
 S P R Y S T N C R E S E C N E S O O T R  
 T E C H I I T G C E B S U Y H P R A P E  
 A E S E E A N P E E R P R B O E A A E R  
 T O R D E D R F S R P E R O S C A S I R  
 I S E T E N I O E P S C A C T I S C F T  
 O R O B S B O R I C S I N A R E E D R A  
 N U R A T G O C F E S E T R O I C C S C  
 R D R R N G E U U D I S E A S E E R C C  
 D E D I S E F A N R C B N N E E K A R E  
 E E S D C R E R S N R G R C I N F E C T  
 R E E R A D I C A T R A F S D R F R Y E  
 H R G E G S C N T R U Y U P U T C R S R



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Name \_\_\_\_\_

Date \_\_\_\_\_

Complete the maze and then find the words. The words can only be found along your maze path.

◀ START

END ▶

TGHQQCIGRSDNEDTILLYCYYGIRDLERIBESSESGWMCLINTWCGCQJVLJYDCUBMOVQNAKKPVSFNDERRCOWWJGKA  
M V F U J H  
O O M B B G F  
T JHQP D QVFUNGUSWPHKJNPATHOGENOUE P B B XBNIRYOTDH T OVHJ Y L DMWK S  
A P A S Y Q O L C G Y W C N  
B X L I A T K W W V P K T M  
CKEU JMWLMFWNHQ SRBL Y D QGQM A WVSXRAXIEIVBFOFOH SSSFVLB ISWU QYPW EYHG  
W Q G Q W F C J W F V K Y U  
D T L R Y P N Q D K U K C S  
I Y S C S NLJI CBRRSDDNNJJ V NQXO HADCRTB LUBA K ANLMLNN TUIMXJSVAA A  
S N P W M J Y T W V F  
E R F Q B I L F W I S  
A WCAP ETFA J NORURWSJKYALG QAEEVBSRPFNVXDWRQHD T D I MYDMKWN FSVDBGYWBIJ  
S O C D T B Y V S M E J P  
E R A R H R D H W P Y L U  
HTAF G Q KAICAPWPUA AVTB OXNBFQTRDT X E UGMJNJK PVQU HYPX QALPBSUXQM N  
H O K B Q N W Q D A N K K O C  
A Y M K X G B B G G F O Y Q  
M UCWYFIV J DVVTEYSWNG O Q P F L YSCANKERX GMSDTQB AXXPQNFCGV A G J A  
M H B J Q H O F X K B I  
G B O Q K V O N M N G F  
WODJWPG JYCQUFNJS Q N FVDFUVR N B RESISTANCE RMWE ROBSTFV KAMUBHW C D  
F O W S M L K U E Y L X B  
E S B Y G I J Q O U X S P  
M GMSWEYO UIRPBEM PITADBY BDMXQAK S X VOXJ SSGH YKOHBIM MRRK EESHSE I V  
P I V J Q T I S U Q Q Y I B  
M L D H T E A I H W M M A Y  
C Q EVJE X KORGBPE W HUVQUGREBBYFR FDUB FKXA KIQE FJAC S S P L JHNV  
N A H O H A A Q A I S R U S O I C Q  
I M E O Q B U L C V R D D H N N Q T  
B D J OKIK W T P L P XRSH E C EVIPDKW OXAM T T VRBN JCHE FNSM Y  
Q U J F U B Q V A P G X B H B Q Q I  
D V F C K I C A B U N G V R P R X  
Y YNXWVXT VGLVXRQ R F WQIN XYOYTVOBGEQWJ B FAUS UECREFORESTATION A LPER  
D C Y O A V M T A C E L E P  
R I F A N T E W M U P D M J  
KGEC I Y W M LJGEKCO D KIGW J A BDIXEJWQCR U G ALTERNATEX IODJCLE I  
N B B I N U J W O R L D L G  
T J V N C Y A O B C T Q I I  
T W D BTUU YDSF NMEKIXTKNM SWVMBDIBOH L YVWIMFK F CIPGSNS DHNS B W H  
N I E C B D I Y H S D G W C J X  
C F X K W Q P Q G Q D J T E W T  
U FDBM B F CQRUIWD AXSR IYHCWNKIWS FKYANMB A BREPBLNUTM VKAB G U H Y  
E R S V X V R L E I I N T T U G T  
V Y B Q A W M F Q E G G W U Q A  
UWEU T L KYWY U R VQNJAJI H XTFEYPK Y XFNOCHS A UOJXTLK W YHWCYOB D  
H X B Q G M H F Y L K U C D I  
B X F D K M F E P V Q X U Y C  
C D X KTGCHRKQKW HSSXUTJBHWUFENPSTDK IOXLWUQ SRXO S J U NSNJRIAKWSMSG K  
K R W W N R D  
E B X F P U

BDSUUFHECFQVSMVRQCSFEKJJOPDEGHRPOHVBGXKPPNJROAXQGUMDSMPWNBPKVBKWCOLHHVCQXQWHMFLAH

Find and circle these words:

**CANKER**  
**PINE**  
**REFORESTATION**

**RIBES**  
**FUNGUS**  
**FIVE**

**BLISTER**  
**RESISTANCE**  
**ALTERNATE**

**DISEASE**  
**GIRDLE**  
**PATHOGEN**



**GAMES!**

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Name \_\_\_\_\_

Date \_\_\_\_\_

### White Pine Blister Rust

Oh no! The letters from 12 words have been curved and hidden in the puzzle. A curved word may start anywhere and can then move in any direction. Once a word has used a square in the puzzle, that word may not re-use the same square, but the square can be re-used for different words.

One word has already been found for you!

R	P	U	H	G	U	K	G	H	K	O	Y
S	S	R	E	E	S	A	E	K	O	D	A
U	B	N	O	G	T	S	K	D	S	I	A
D	I	F	D	C	T	U	E	G	O	A	
D	K	T	E	A	D	I	B	Y	R	O	T
D	F	D	N	E	R	E	C	G	N	B	T
I	H	B	E	A	R	R	I	A	Y	N	G
F	C	U	F	R	R	C	U	B	T	S	H
R	B	R	Y	U	K	A	E	S	E	E	O
R	S	H	E	E	N	T	E	G	I	A	R
F	E	P	R	C	I	E	S	S	N	T	O
O	R	E	S	T	A	T	I	O	N	P	N

Find and draw a line through these words:

~~DISEASE~~  
CURRANT  
ERADICATE

SHRUB  
REFORESTATION  
HOST

ORANGE  
CANKER  
RIBES

INFECT  
GOOSEBERRY  
SPECIES



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# Plant Heroes Pledge

This Certifies That

---

is an Official Member of the Plant Heroes Team and pledges to:

**Learn about the  
pests and diseases  
that affect the  
plants in my region**

**Be on the lookout  
for symptoms of  
pests and diseases  
on trees in my  
neighborhood**

**Report any suspicious  
findings to an adult  
who can notify the  
local extension agent**

**Refrain from  
moving firewood**

Awarded by the  
American Public  
Gardens Association





Join our team of Plant Heroes and learn about trees, forests, and the natural world around you!

**PLANTHEROES.ORG**

### You can be a Plant Hero!

Are you curious about plants and animals? Do you like asking questions about nature? Do you enjoy being outdoors and having fun, climbing trees, balancing on logs, or finding a new butterfly or beetle? If so, you are already on your way to becoming a Plant Hero! We invite you to join forces with Nate, Laura, Aponi, and Frankie to protect the plants and ecosystems we all love.

### How can you become a Plant Hero?

Join our team and go on a journey with Nate, Aponi, Laura, and Frankie. As a Plant Hero, you will learn to notice when plants are in trouble. You will also find out ways you can act quickly to help find solutions in your own neighborhood. Follow their adventures and learn how they help plants and ecosystems stay healthy.

**On the Plant Heroes website, you will find** materials to help you learn about plants, forest health, and ecosystem balance. The more you know, the more you can help protect plants and ecosystems in your own yard, neighborhood, and community!

**Plant Heroes strives to spark curiosity about nature and science in all children.** Our program provides hands-on, nature-based learning materials for educators to engage children in topics of plant health, ecosystem balance, and forest health. We also spotlight the amazing work our public gardens do in protecting the plants and ecosystems we all depend on through our website and printed materials. Visit [plantheroes.org](http://plantheroes.org) today to learn more!

**Plant Heroes is brought to you by the American Public Gardens Association**, founded in 1940. Over the last eight decades, the Association has supported the work of public gardens in North America and beyond. Our mission is to champion and advance public gardens as leaders, advocates, and innovators in the conservation and appreciation of plants. Our vision is "A world where public gardens are indispensable" as they provide botanic, conservation, community, education, and economic resources to their community.

The Association is committed to increasing the knowledge of public garden professionals throughout North America through information sharing, professional development, networking, public awareness, and research, so that they have the tools to effectively serve visitors and members.



**American  
Public Gardens  
Association**

[PublicGardens.org](http://PublicGardens.org)



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