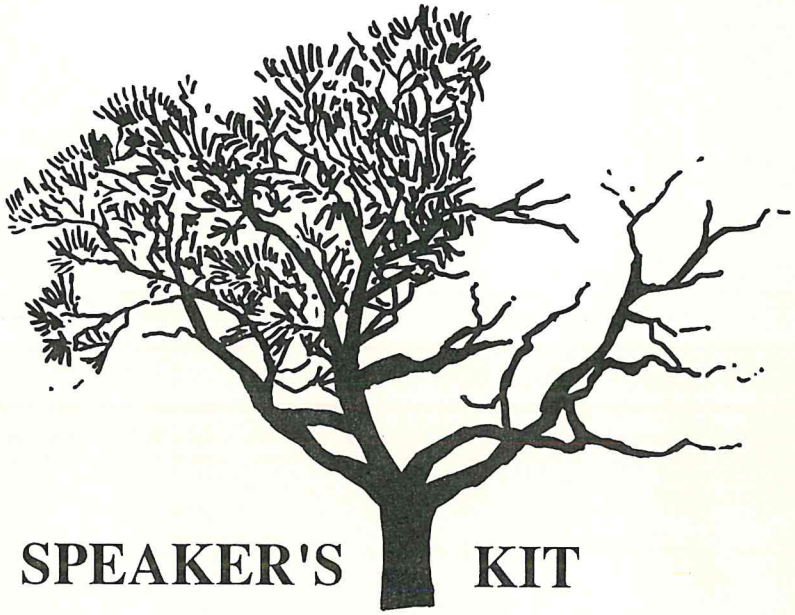

SPEAKER'S KIT

Fight dieback

Give our plants a chance

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

[redacted] Dear Rotarians

ROTARY'S DIEBACK PUBLIC AWARENESS CAMPAIGN

Dieback is the greatest conservation threat facing Western Australia.

This introduced plant disease has killed hundreds of thousands of plants across the south west of the State in our national parks, forests, nurseries, orchards and even back gardens. Some native plants are close to extinction in the wild as a result.

There's no practical cure, but the search for one continues. At the same time, the Department of Conservation and Land Management has an extensive range of measures to limit the spread of the disease.

Twenty years ago it seemed our jarrah forests would be wiped out by what was then known as "jarrah dieback".

Today, however, the disease is contained in about 14 per cent of the forest through a combination of research, quarantining of healthy areas, hygienic operations and public education.

The same strategy is being used to fight what some now think of as "wildflower dieback" on the south coast and the sandplains north of Perth.

Although some areas were infected before the disease was named in 1922, public understanding of the disease is still limited.

With your support, the Dieback Public Awareness Campaign launched by Rotary International District 9460 will help change that.

The fight against dieback can't be won just by Government departments and scientists, but must involve the whole community.

Dieback in this State is most commonly spread by people. The greatest single step we can take to stop this killer is to stop its artificial spread. This will only be done by increasing public awareness.

Thank you for your support,

Lindsay Archer
District Governor 1990-91
ROTARY INTERNATIONAL DISTRICT 9460

Syd Shea
Executive Director
CALM

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The resource material in this speaker's kit has been designed as support for a campaign of talks to different community groups. This will boost the work already done by CALM, allowing an even greater audience to be reached.

If you need further copies of the kit or have any queries about it, please contact Ms Caris Bailey, CALM Public Relations Co-ordinator, on (09) 389 8644 or by fax on (09) 389 8296. Technical inquiries should be addressed to Mr Roger Armstrong, CALM Senior Environmental Officer, on (097) 254 300.

AIM OF THE DIEBACK CAMPAIGN

To increase public awareness and understanding of -

- *the conservation threat facing Western Australia,*
- *the real threat to multi-million dollar industries including tourism, forestry, wildflower picking, honey collection and some horticulture,*
- *the need for the whole community to fight dieback, and*
- *the simple precautions that can be taken to stop the spread of the disease.*

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5 __ Dead dryandra on a dieback infected site.

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DIEBACK

GIVE OUR PLANTS A CHANCE

DIEBACK - AN OVERVIEW

A FATAL DISEASE IS SWEEPING THROUGH THE SOUTH WEST OF OUR STATE.

THERE'S NO PRACTICAL CURE AND ANY ONE OF US HERE COULD BE A CARRIER.

WHOLE FAMILIES ARE THREATENED AND THE SICK LIST IS GROWING DAILY.

IT'S A DISEASE WHICH KILLS SOME SLOWLY, BUT MOST OFTEN STRIKES ITS VICTIM DOWN BEFORE ANY SYMPTOMS ARE APPARENT.

IT'S A DISEASE THAT'S DEAD EASY TO PICK UP AND TRANSMIT - BUT ALL IT TAKES TO STOP IT IN ITS TRACKS IS A GOOD WASH.

THE DISEASE IS DIEBACK, CAUSED BY A FUNGUS THAT ATTACKS AND KILLS HUNDREDS OF DIFFERENT PLANT SPECIES IN MANY DIFFERENT FAMILIES IN WESTERN AUSTRALIA.

THOSE AFFECTED RANGE FROM GREVILLEA AND BANKSIA TO EUCALYPTUS AND BOTTLEBRUSH AND THE HEATHS, BUT THE DISEASE DOESN'T RESTRICT ITSELF TO THE BUSH. AZALEAS, CAMELLIAS, PEACHES, PLUMS, AVOCADO AND PINEAPPLES ARE AMONG THE LIST OF OTHER HIGHLY SUSCEPTIBLE PLANTS. AT LEAST ONE THOUSAND PLANTS ARE AFFECTED WORLDWIDE.

THE MICROSCOPIC FUNGUS LIVES IN PLANT ROOTS AND THE SOIL AND IS EASILY CARRIED ON THE WHEELS AND UNDERBODIES OF CARS AND ON THE SHOES OF BUSHWALKERS...WASH THE SOIL OFF AND YOU LEAVE THE DISEASE BEHIND.

DIEBACK WAS UNWITTINGLY INTRODUCED TO WA ABOUT A HUNDRED YEARS AGO AND IT'S HAD A DEVASTATING EFFECT ON THE MANY NATIVE PLANTS WITH NO RESISTANCE TO THE FUNGUS.

THE DISEASE IS THOUGHT TO HAVE BEEN CARRIED INTO THE STATE ON TREES IMPORTED FROM INDONESIA, EITHER IN THE ROOTS OR THE SOIL AROUND THEM.

IT KILLS PLANTS BY ROTTING THEIR ROOTS SO THEY CAN'T ABSORB WATER OR NUTRIENTS, OFTEN GIVING THE APPEARANCE OF PLANTS DYING OF DROUGHT.

MOST PLANTS DIE QUICKLY, THEIR LEAVES TURNING BROWN OR YELLOW AND, UNLIKE SOME BURNT PLANTS, THEY WILL NEVER RESPROUT.

ALTHOUGH DIEBACK WAS CARRIED INTO WA AROUND THE TURN OF THE CENTURY, IT WASN'T UNTIL THE MID-1960's THAT IT WAS IDENTIFIED AS THE CAUSE OF MANY PLANT DEATHS SEEN IN THE STATE.

NOT KNOWING THE KILLER'S IDENTITY PREVENTED EFFECTIVE CONTROL FOR DECADES. IN THIS TIME, THE FUNGUS WAS UNINTENTIONALLY SPREAD THROUGHOUT THE SOUTH WEST OF THE STATE.

MACHINERY WORKING IN THE FOREST, INCLUDING THE CHANGE FROM RAIL TO ROAD TRANSPORT, THE CONSTRUCTION OF NEW ROADS AND THE MATERIAL USED TO BUILD THEM ALL HELPED TO SPREAD THE UNSUSPECTED FUNGUS.

IT'S NOW KNOWN TO OCCUR IN PATCHES OVER AN AREA FROM KALBARRI IN THE NORTH TO CAPE ARID, EAST OF ESPERANCE, AND INLAND TO BOYAGIN ROCK, NEAR PINGELLY.

THE SOUTH COAST IS PARTICULARLY AT RISK BECAUSE THE CLIMATE IS WARM AND MOIST FOR MOST OF THE YEAR, PROVIDING IDEAL CONDITIONS FOR THE TROPICAL FUNGUS.

WHAT'S AT RISK IS THE EXTINCTION OF MANY RARE AND ENDANGERED PLANTS, TOGETHER WITH SOME OF THE ANIMALS THAT DEPEND ON THEM FOR FOOD AND SHELTER.

THE NATIONAL PARKS AND RESERVES OF THE SOUTH COAST REGION CONTAIN COMBINATIONS OF PLANTS AND ANIMALS FOUND NOWHERE ELSE IN THE WORLD.

THE FITZGERALD RIVER NATIONAL PARK BETWEEN ALBANY AND ESPERANCE, FOR EXAMPLE, IS A PARTICULARLY RICH AREA. IT CONTAINS MORE THAN 1,700 DIFFERENT SPECIES OF PLANTS - ONE FIFTH OF ALL THE PLANTS DESCRIBED IN WESTERN AUSTRALIA AND MORE THAN THE WHOLE OF SOUTH AUSTRALIA CAN BOAST.

THE RISK - AND DAMAGE ALREADY DONE - TO AREAS SUCH AS FITZGERALD RIVER ARE SIGNIFICANT ENOUGH, BUT THERE'S A FURTHER THREAT.

A WIDE RANGE OF INDUSTRIES, INCLUDING TOURISM, FORESTRY, WILDFLOWER PICKING, HONEY COLLECTION AND SOME HORTICULTURE, COULD LOSE MILLIONS OF DOLLARS AS THE TREES AND PLANTS THEY DEPEND ON ARE INFECTED OR EVEN WIPED OUT.

WHAT IS DIEBACK?

DIEBACK IS AN INTRODUCED FUNGUS WHICH NEEDS A PLANT TO FEED ON AND SURVIVE. IT'S SIMILAR TO THE FUNGUS WHICH GROWS ON BREAD OR ORANGES, EXCEPT IT GROWS IN THE ROOTS OF SUSCEPTIBLE PLANTS AND BETWEEN SOIL PARTICLES.

THE MAIN BODY OF THE FUNGUS IS A MASS OF THREADS, CAPABLE OF PRODUCING THE MILLIONS OF TINY SPORES WHICH REPRODUCE THE FUNGUS.

THE DIEBACK FUNGUS PRODUCES TWO MAIN TYPES OF SPORE. ONE IS SMALL AND CAN BE SPREAD RAPIDLY BY FLOWING WATER, OR SWIM A SHORT DISTANCE IN MOISTURE BETWEEN SOIL PARTICLES. WHEN THEY COME IN CONTACT WITH ROOTS THEY LODGE THERE AND INFECT THE PLANT. THEY GROW IN SUSCEPTIBLE PLANTS, ROTTING THE ROOTS AND CUTTING OFF THE PLANT'S WATER SUPPLY.

THE LARGER SPORE HAS A THICK WALL TO PROTECT IT FROM DEHYDRATION. THIS MEANS THEY CAN SURVIVE FOR UP TO EIGHT MONTHS IN THE SOIL, PROVIDING CONDITIONS DON'T BECOME TOO DRY. THESE SPORES CAN'T MOVE ON THEIR OWN, UNLIKE THE SMALLER ONES, BUT THEY CAN BE TRANSFERRED WITH PARTICLES OF INFECTED SOIL OR ROOTS. WHEN CONDITIONS ARE FAVOURABLE, THE FUNGUS AGAIN BECOMES ACTIVE.

DIEBACK IS MOST ACTIVE IN WARM, MOIST CONDITIONS - USUALLY IN SPRING AND AUTUMN. IN WINTER IT SURVIVES IN MOIST SOIL, BUT LOW TEMPERATURES KEEP IT INACTIVE.

WHEN THE SOIL DRIES OUT IN SUMMER THE FUNGUS USUALLY DIES, BUT IT DOES HAVE WAYS TO SURVIVE - IN INFECTED ROOTS OR IN SOIL WHICH RETAINS SOME MOISTURE ALL YEAR, SUCH AS GULLIES, SWAMPS AND POORLY DRAINED SOIL.

HOW DOES DIEBACK SPREAD?

TO SPREAD NATURALLY, THE DISEASE NEEDS MOISTURE OR ROOT CONTACT; PASSING FROM INFECTED ROOTS TO HEALTHY ROOTS WHEN THEY COME IN CONTACT.

THE SMALL DIEBACK SPORES ARE CARRIED IN SURFACE WATER OR IN GROUND WATER, OR MOVE THROUGH MOIST SOIL, SPREADING QUICKLY DOWN SLOPES.

DAMP, LOW LYING AREAS ARE OFTEN HEAVILY INFECTED IN THIS WAY, BUT THE FUNGUS CAN ALSO SPREAD UPHILL THROUGH ROOTS.

A FAR MORE SERIOUS PROBLEM IN WESTERN AUSTRALIA IS THE ARTIFICIAL SPREAD OF THE FUNGUS, PARTICULARLY IN SOIL CARRIED ON VEHICLES.

WHEN CONDITIONS ARE WET AND ROADS ARE MUDDY, INFECTED SOIL CAN COLLECT IN TYRES AND UNDER VEHICLES AND BE TRANSPORTED GREAT DISTANCES, SPREADING THE FUNGUS TO PREVIOUSLY HEALTHY AREAS.

ANY ACTIVITY WHICH DISTURBS THE SOIL CAN SPREAD DIEBACK, ESPECIALLY OPERATIONS SUCH AS ROAD BUILDING WHICH INVOLVE HEAVY EQUIPMENT MOVING LOTS OF SOIL AND GRAVEL.

HOWEVER, PEOPLE AND ANIMALS MAY SPREAD DIEBACK SIMPLY BY COLLECTING EVEN A SMALL AMOUNT OF INFECTED SOIL AND MOVING IT TO ANOTHER SITE.

IT IS POSSIBLE TO KILL DIEBACK WITH FUNGICIDES, BUT NOT PRACTICAL TO ERADICATE. THE FACT THAT THE FUNGUS CAN BE MORE THAN TWO METRES DEEP AND THE SHEER SIZE OF THE AREAS AFFECTED MEANS THERE'S NO ENVIRONMENTALLY ACCEPTABLE, OR AFFORDABLE "CURE".

THE WIDESPREAD USE OF SUCH A FUNGICIDE COULD BE DETRIMENTAL TO OTHER ORGANISMS, SUCH AS THE BENEFICIAL FUNGI IN THE SOIL WHICH HELP PLANTS TAKE UP NUTRIENTS.

PREVENTION IS NOT SEEN AS BETTER THAN A CURE FOR DIEBACK, INSTEAD THE STRATEGY HAS BEEN PREVENTION UNTIL A CURE CAN BE FOUND.

THIS STRATEGY IS BASED ON A COMBINATION OF MAPPING, QUARANTINE, HYGIENE, RESEARCH AND PUBLIC EDUCATION.

I'D LIKE TO TOUCH BRIEFLY ON EACH OF THESE POINTS.

MAPPING

THE MAPPING OF DIEBACK DISTRIBUTION HAS BEEN ESSENTIAL IN PINPOINTING THE DISEASE AND STUDYING ITS SPREAD.

IN THE LATE 1970's, THE DEVELOPMENT OF SHADOWLESS, COLOUR AERIAL PHOTOGRAPHY GREATLY INCREASED THE ACCURACY OF DIEBACK MAPPING, SUPPLEMENTING THE PREVIOUS TECHNIQUES OF SIGHTINGS AND RECOVERING THE FUNGUS FROM SOIL AND PLANT SAMPLES.

FURTHER ACCURACY HAS BEEN GAINED AS THE TECHNOLOGY CONTINUES TO IMPROVE.

THE MAPPING SYSTEM DEVELOPED BY CALM STAFF FOR THE JARRAH FOREST IS PROBABLY THE MOST SOPHISTICATED FOREST DISEASE DETECTION TECHNIQUE IN THE WORLD.

ONE OF THE MAPPING TECHNIQUES CURRENTLY BEING TESTED IS REMOTE SENSING AT TWO PEOPLES BAY NATURE RESERVE, NEAR ALBANY. UNLIKE PHOTOGRAPHY, REMOTE SENSING DETECTS INFRA RED AND THERMAL DATA WHICH SHOWS PLANT CELLULOSE LEVELS AND ANY STRESS CAUSED BY WATER LOSS. THIS MEANS INFECTED PLANTS CAN BE SPOTTED BEFORE THEY SHOW VISIBLE SIGNS OF DYING.

QUARANTINE

DIEBACK IN WA WAS FIRST REPORTED IN THE JARRAH FORESTS AND, IN FACT, MANY PEOPLE STILL THINK OF THE DISEASE AS ONLY "JARRAH DIEBACK".

IN 1976 THE FORESTS DEPARTMENT, NOW PART OF THE DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT, QUARANTINED LARGE AREAS OF STATE FOREST BY CLOSING ROADS AND INTRODUCING PROCEDURES FOR LOGGING AND MINING TO PREVENT THE SPREAD OF THE DISEASE IN THESE AREAS. QUARANTINE GIVES ANY EXISTING INFECTION TIME TO DEVELOP SYMPTOMS WHICH CAN THEN BE DETECTED AND MAPPED.

QUARANTINE IS STILL USED IN THE FOREST AND IN NATIONAL PARKS AND RESERVES, WHERE ROADS AND TRACKS HAVE BEEN CLOSED TO PROTECT THE HIGHLY SUSCEPTIBLE VEGETATION FROM FUNGUS CARRIED ON VEHICLES.

VEHICLE ENTRY IS RESTRICTED AT TIMES WHEN DAMP SOIL IS LIKELY TO STICK TO WHEELS AND MACHINERY. THESE RESTRICTIONS APPLY TO ALL VEHICLES AND OPERATIONS SUCH AS FORESTRY, ROAD BUILDING, MINING, AND FIREWOOD COLLECTION BY THE PUBLIC.

HYGIENE

HYGIENE IS A COMMON MEDICAL EXPRESSION, BUT IT'S JUST AS IMPORTANT FOR PLANT HEALTH.

WASHING DOWN EQUIPMENT WAS INSTALLED AT THE SAME TIME AS QUARANTINE AREAS WERE DECLARED SO THAT VEHICLES AND MACHINERY DID NOT CARRY SOIL FROM INFECTED TO HEALTHY AREAS.

HIGH PRESSURE WATER JETS WASH THE SOIL FROM TYRES AND UNDERBODIES, LITERALLY STOPPING THE FUNGUS IN ITS TRACKS.

HYGIENE IS CONSIDERED FOR ALL CALM OPERATIONS, INCLUDING FIRE CONTROL, ROAD CONSTRUCTION AND MAINTENANCE AND TIMBER REGENERATION. HYGIENE METHODS DEVELOPED IN STATE FORESTS ARE NOW BEING ADAPTED TO MINING AND RECREATION AREAS AS WELL AS TO NATIONAL PARKS AND NATURE RESERVES IN THE SOUTH WEST.

OTHER AGENCIES ARE NOW PLANNING PROJECTS SUCH AS MAJOR HIGHWAYS, POWER LINES AND PIPE LINES WITH HYGIENE IN MIND, BUT A LOT MORE STILL NEEDS TO BE DONE.

RESEARCH

DIEBACK IS ONE OF THE MOST WIDESPREAD PLANT DISEASES IN THE WORLD. SCIENTISTS HAVE BEEN WORKING FOR DECADES TO FIND A CURE.

IN WESTERN AUSTRALIA, THE DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT IS CONTINUING THE EXTENSIVE RESEARCH WORK OF ONE OF ITS PREDECESSORS, THE FORESTS DEPARTMENT. RESEARCH WORK IS ALSO CARRIED OUT IN UNIVERSITIES HERE AND IN THE EASTERN STATES.

AS WELL AS LOOKING FOR A PRACTICAL CURE FOR THE DISEASE IN WEST AUSTRALIAN CONDITIONS, SCIENTISTS ARE LOOKING FOR WAYS TO STOP ITS SPREAD AND IMPROVE PLANT RESISTANCE.

CONTROL METHODS BEING DEVELOPED INCLUDE THE SYSTEMIC FUNGICIDE, PHOSPHOROUS ACID, SELECTING AND GROWING PLANTS WITH GREATER NATURAL RESISTANCE TO REPLACE OTHERS KILLED BY DIEBACK AND IMPROVING DRAINAGE IN SOME AREAS.

PUBLIC EDUCATION

SINCE ANY OF US HERE COULD CARRY THE DISEASE, IT'S ESSENTIAL THAT WE KNOW THE RISKS AND HOW WE CAN HELP STOP THIS KILLER.

UNDERSTANDING THE PROBLEM EXPLAINS THE NEED TO STICK TO WELL FORMED TRACKS WHEN DRIVING THROUGH THE BUSH AND WHY SOME ROADS AND TRACKS HAVE TO BE CLOSED FROM TIME TO TIME.

CALM STAFF ARE TAUGHT THE BIOLOGY OF THE FUNGUS DURING THEIR TRAINING IN PROTECTIVE PROCEDURES AND WORK WITH THE PROCEDURES LAID DOWN IN CALM'S DIEBACK HYGIENE MANUAL.

THE DEPARTMENT ALSO PROVIDES DIEBACK PREVENTION TRAINING AND ADVICE TO STAFF FROM AN INCREASING NUMBER OF LOCAL SHIRES, OTHER GOVERNMENT DEPARTMENTS AND PRIVATE COMPANIES.

ROTARY INTERNATIONAL DISTRICT 9460 HAS ADDED TO CALM'S PUBLIC EDUCATION PROGRAMMES BY LAUNCHING ITS OWN DIEBACK AWARENESS CAMPAIGN.

TALKS SUCH AS THIS ARE BEING ORGANISED THROUGH EACH OF THE DISTRICT'S 40 CLUBS FROM THE PERTH METROPOLITAN AREA TO ESPERANCE.

THE FUTURE

THE FIGHT AGAINST DIEBACK IS NOT HOPELESS AS EXPERIENCE SHOWS.

THE VERY REAL FEARS IN THE 1970s THAT OUR WHOLE JARRAH FOREST WOULD BE DEAD AND GONE BY NOW HAVE NOT EVENTUATED, THANKS TO RESEARCH AND HYGIENIC WORK PRACTICES.

TODAY THE DISEASE IS CONTAINED IN ABOUT 14 PER CENT OF THE FOREST. THIS MEANS THE MAJORITY OF OUR FORESTS - AND OUR PARKS AND RESERVES - ARE STILL HEALTHY, BUT ONLY AS LONG AS WE KEEP THEM THAT WAY.

WE CAN'T AFFORD TO FORGET IS THAT DIEBACK IS THE GREATEST CONSERVATION THREAT FACING THIS STATE.

DIEBACK IS A KILLER ON THE LOOSE WITH A LONG LIST OF VICTIMS AND ANY ONE OF US COULD MAKE IT WORSE.

THE ALTERNATIVE IS EASY. PLEASE STICK TO WELL FORMED ROADS WHEN DRIVING THROUGH THE BUSH, AVOIDING PUDDLES AND MUD, OBSERVE THE "CLOSED" SIGNS ON ROADS AND TRACKS AND USE THE WASHDOWN STATIONS WHEREVER THEY'RE PROVIDED, MAKING SURE NOT TO DRIVE THROUGH THE PUDDLES AND MUD YOU'VE JUST WASHED OFF.

THIS WATER SHOULD DRAIN UNDER THE WASHDOWN, WHERE IT'S EITHER CONTAINED, OR TREATED.

INSTEAD OF DIEBACK, YOU'LL BE GIVING OUR PLANTS A CHANCE TO FIGHT BACK.

.....

DIEBACK
GIVE OUR PLANTS A CHANCE

"JARRAH" DIEBACK

JARRAH DIEBACK IS A TERM THAT'S BEEN AROUND FOR SOME TIME, SOMETHING THAT MEANS TREES DYING IN OUR FORESTS TO MOST PEOPLE.

SINCE OUR TIMBER INDUSTRY SEEMS INTACT AND A DRIVE IN THE COUNTRY DOESN'T SHOW TOO MANY DEAD TREES, YOU COULD THINK DIEBACK WAS JUST ONE OF THOSE THINGS THAT JARRAH HAS ADAPTED TO OVER THE YEARS.

OTHER EXAMPLES WOULD BE THE WAY IT'S ADAPTED TO OUR HOT, DRY SUMMERS OR THE WAY IT'S ADAPTED TO BUSH FIRES, WHICH HAVE BEEN A NATURAL PART OF THE BUSH FOR THOUSANDS OF YEARS.

YOU'D BE WRONG.

THE FUNGUS THAT CAUSES DIEBACK IS NOT A NATURAL PART OF THE BUSH AND IT IS NOT CONFINED TO JARRAH TREES, OR FOR THAT MATTER TO THE JARRAH FOREST.

DIEBACK WAS ACCIDENTALLY BROUGHT IN FROM INDONESIA AROUND THE TURN OF THE CENTURY BEFORE CUSTOMS CONTROLS WERE INTRODUCED.

IT KILLS ABOUT A THOUSAND PLANT SPECIES AROUND THE WORLD AND HERE IN WESTERN AUSTRALIA HAS ALREADY BROUGHT SOME RARE NATIVE PLANTS CLOSE TO EXTINCTION AND IS KILLING HUNDREDS MORE.

IN FACT, DIEBACK IS NOW OUR GREATEST CONSERVATION THREAT.

RARE PLANTS AND THE ANIMALS THAT DEPEND ON THEM FOR FOOD AND SHELTER ARE DYING ACROSS THE SOUTH WEST OF THE STATE.

NOW IN THE MIDDLE OF A RECESSION, THE WELFARE OF SOME OF OUR UNIQUE ECOSYSTEMS MAY NOT BE UPPERMOST IN YOUR MIND.

LET ME PUT IT ANOTHER WAY.

THE LATEST FIGURES AVAILABLE FROM THE 1990 WA YEAR BOOK SHOW AN ANNUAL RETURN OF:

· $2.7 MILLION FROM PEACH GROWING,

· $2.6 MILLION FROM PLUMS AND PRUNES,

· MORE THAN $9 MILLION FROM TOMATOES, AND

· $46.5 MILLION FROM COMMERCIAL NURSERIES.

THE LATEST FIGURES AVAILABLE FROM THE DEPARTMENT OF AGRICULTURE SHOW THAT HONEY, BEESWAX AND POLLEN PRODUCTION HERE EARNED $4.4 MILLION IN 1987-88.

EXPORTS OF WA WILDFLOWERS CAME TO $8.5 MILLION IN 1989 AND THE LOCAL MARKET WAS ESTIMATED TO BE WORTH AT LEAST THE SAME AMOUNT AGAIN.

THE STATE'S TIMBER INDUSTRY HAD A SALES TURNOVER OF $700 MILLION IN 1989-90.

TOURISM IN THE SOUTH WEST WAS WORTH MORE THAN ONE AND A HALF BILLION DOLLARS IN THE SAME PERIOD.

EACH OF THESE INDUSTRIES IS DIRECTLY OR INDIRECTLY THREATENED BY DIEBACK AND THIS LIST IS BY NO MEANS COMPLETE.

AVOCADOES, PINEAPPLES, PEARS, NECTARINES AND CHESTNUTS ARE AMONG THE MANY OTHER SUSCEPTIBLE PLANTS

SO WHAT IS DIEBACK AND HOW CAN SOMETHING MANY PEOPLE REFER TO AS "JARRAH" DIEBACK THREATEN MULTI-MILLION DOLLAR INDUSTRIES OUTSIDE THE FOREST?

DIEBACK IS ONE OF THE MOST WIDESPREAD PLANT DISEASES IN THE WORLD, CAUSED BY A MICROSCOPIC FUNGUS THAT FEEDS ON PLANT ROOTS, STARVING SUSCEPTIBLE PLANTS OF WATER AND NUTRIENTS UNTIL THEY DIE.

MOST PLANTS DIE QUICKLY, THEIR LEAVES TURNING BROWN OR YELLOW.

AND, UNLIKE SOME BURNT PLANTS, THEY WILL NEVER RESPROUT.

THE FUNGUS LIVES IN PLANT ROOTS AND BETWEEN SOIL PARTICLES, WHERE IT CAN SURVIVE WITHOUT A HOST TO FEED ON FOR UP TO EIGHT MONTHS.

ITS MAIN BODY IS A MASS OF THREADS, CAPABLE OF PRODUCING THE MILLIONS OF TINY SPORES WHICH REPRODUCE THE FUNGUS.

DIEBACK PRODUCES TWO MAIN TYPES OF SPORE. ONE IS SMALL AND CAN BE SPREAD RAPIDLY BY FLOWING WATER OR SWIM A SHORT DISTANCE IN MOISTURE BETWEEN SOIL PARTICLES. THEY ARE ATTRACTED TO THE GROWING TIPS OF ROOTS OF A WIDE RANGE OF PLANT SPECIES, WHERE THEY LODGE AND INFECT THE PLANT.

THEY GROW IN SUSCEPTIBLE PLANTS, ROTTING THE ROOTS AND CUTTING OFF THE PLANT'S WATER SUPPLY.

THE LARGER SPORE HAS A THICK WALL TO PROTECT IT FROM DEHYDRATION. THIS SPORE CAN'T MOVE ON ITS OWN, UNLIKE THE SMALLER ONE, BUT IS EASILY TRANSPORTED WITH PARTICLES OF INFECTED SOIL OR ROOTS. WHEN CONDITIONS ARE FAVOURABLE, THE FUNGUS BECOMES ACTIVE AGAIN.

THE TROPICAL FUNGUS IS MOST ACTIVE IN WARM, MOIST CONDITIONS - USUALLY IN SPRING AND AUTUMN. IT SURVIVES IN WINTER IN MOIST SOIL, BUT LOW TEMPERATURES KEEP IT INACTIVE. WHEN THE SOIL DRIES OUT IN SUMMER THE FUNGUS USUALLY DIES, BUT IT WILL SURVIVE IN INFECTED ROOTS OR IN SOIL WHICH STAYS MOIST, SUCH AS GULLIES, SWAMPS AND POORLY DRAINED SOIL.

"JARRAH" DIEBACK

THE ASSOCIATION BETWEEN DIEBACK AND JARRAH GOES BACK TO 1922 WHEN SMALL PATCHES OF DEAD TREES WERE REPORTED NEAR KARRAGULLEN, EAST OF PERTH, WITH NO APPARENT CAUSE OF DEATH.

IRONICALLY THAT SAME YEAR A DUTCH PLANT PATHOLOGIST PUBLISHED THE FIRST DESCRIPTION OF THE DIEBACK FUNGUS, *PHYTOPHTHORA CINNAMOMI* , AFTER IDENTIFYING IT ON THE ROOTS OF CINNAMON TREES.

IT WAS MORE THAN 40 YEARS AND THOUSANDS OF HECTARES OF DESTROYED WEST AUSTRALIAN PLANTS LATER BEFORE THE FUNGUS WAS PROVED TO BE THE DIEBACK CULPRIT.

THE NAME *PHYTOPHTHORA* COMES FROM TWO GREEK WORDS MEANING "PLANT DESTROYER" AND IT DESCRIBES A NUMBER OF RELATED FUNGI.

THE IRISH POTATO FAMINE OF THE 1840's WAS CAUSED BY ONE OF THE *PHYTOPHTHORA* SPECIES - ONE WHICH IS NOT FOUND IN WA - DRASTICALLY REDUCING THE IRISH POPULATION BY THREE MILLION PEOPLE.

ONE MILLION DIED FROM STARVATION AND ASSOCIATED DISEASES AND ANOTHER TWO MILLION EMIGRATED TO AMERICA, CANADA, AUSTRALIA AND OTHER COMMONWEALTH COUNTRIES LOOKING FOR A BETTER LIFE.

THE DIEBACK FUNGUS WAS PROBABLY CARRIED INTO WA ON THE ROOTS OF TREES IMPORTED FROM INDONESIA WITH SOIL AND ROOT BALLS WRAPPED IN HESSIAN BAGS.

BY THE LATE 1920's, AREAS OF FOREST THOUGHT TO BE DISEASED COULD BE SEEN ON LARGE SCALE AERIAL PHOTOGRAPHS.

THE AREAS AFFECTED WERE ONLY SMALL AND THERE WERE RELATIVELY FEW NEW INFECTIONS APPARENT UNTIL AFTER THE SECOND WORLD WAR, WHEN THERE WAS A MASSIVE INCREASE IN THE USE OF WHEELED VEHICLES IN THE FOREST AND THROUGHOUT THE SOUTH WEST.

THE WIDESPREAD USE OF BULLDOZERS, LOW LOADERS AND GRADERS ALLOWED EXTENSIVE ROADWORKS TO BE CARRIED OUT AND GREATER MOBILITY IN THE FOREST. RAIL TRANSPORT OF TIMBER WAS REPLACED WITH TRUCKS ON THE NEW NETWORK OF ROADS.

THE MOVEMENT OF INFECTED SOIL AT A TIME WHEN THE CAUSE OF THE DISEASE WAS STILL UNKNOWN SPREAD THE DISEASE RAPIDLY.

RESEARCH INTENSIFIED AS THE DISEASE SPREAD AND IN 1965 THE CAUSE OF JARRAH DIEBACK WAS CONFIRMED. UNFORTUNATELY, NO CURE WAS KNOWN SO PREVENTION WAS ESSENTIAL.

TIMBER PRODUCTION WAS ONLY ONE OF THE VALUES AT RISK. MANY OTHER SPECIES WERE DYING, AFFECTING WILDLIFE AND HONEY PRODUCTION, AND OUR WATER SUPPLY WAS THREATENED.

IF DIEBACK DESTROYS ENOUGH VEGETATION, THE DRAW ON GROUND WATER DROPS AND THE WATER LEVEL RISES...THIS MEANS RISING SALINITY LEVELS. FORTUNATELY, THIS HASN'T HAPPENED

IN MANY AREAS BECAUSE OF THE SUCCESS OF DIEBACK CONTROL MEASURES.

THE FOREST WAS ZONED ACCORDING TO THE AREAS AFFECTED BY DIEBACK AND LOGGING PROCEDURES MODIFIED, BUT THERE WAS STILL NOT ENOUGH KNOWN TO SLOW ITS SPREAD SIGNIFICANTLY.

THE RATE OF DIEBACK DEATHS DID DROP AFTER 1965, BUT THIS WAS MAINLY BECAUSE OF THE DROP IN ROADWORKS.

IN 1971, TRIALS WITH SHADOWLESS, COLOUR AERIAL PHOTOGRAPHY BEGAN IN THE HOPE OF FINDING AN ACCURATE MAPPING TECHNIQUE TO ASSESS THE SPREAD OF THE DISEASE.

THE PROGRAMME WAS HINDERED, HOWEVER, BY THE LACK OF A RELIABLE NAVIGATION SYSTEM FOR AIRCRAFT UNTIL NEW EQUIPMENT WAS INTRODUCED IN 1977.

IN 1973, A FORESTS DEPARTMENT REVIEW OF DIEBACK CONTROL FOUND THE MAIN CAUSE OF DISEASE SPREAD WAS MOVING INFECTED SOIL AND THAT SYMPTOMS ON NEW INFECTIONS TOOK SOME TIME TO DEVELOP.

TERMS MORE COMMONLY ASSOCIATED WITH HUMAN DISEASES WERE NOW USED, TERMS SUCH AS HYGIENE AND QUARANTINE WHICH WERE TO PROVE AS IMPORTANT TO PLANT HEALTH AS THEY WERE TO HUMAN MEDICINE.

FOREST HYGIENE MEANS CLEAN WORK PRACTICES SO INFECTED SOIL IS NOT CARRIED INTO UNINFECTED AREAS. THESE PROCEDURES INCLUDE WASHING SOIL OFF VEHICLES AND WHERE POSSIBLE, WORKING IN DRY CONDITIONS WHEN SOIL IS LESS LIKELY TO STICK TO VEHICLES.

THE FOREST QUARANTINE SYSTEM WAS INTRODUCED IN 1976 TO OVERCOME ONE OF THE MAIN OBSTACLES TO PROPER FOREST HYGIENE - THE INABILITY TO DETECT ALL DISEASE OUTBREAKS BECAUSE OF THE TIME LAPSE BETWEEN INFECTION AND THE APPEARANCE OF SYMPTOMS.

QUARANTINING AREAS OF FOREST AT RISK NOT ONLY BOUGHT TIME FOR DISEASE SYMPTOMS TO DEVELOP, BUT FOR FURTHER RESEACH AND IMPROVED CONTROL TECHNIQUES AND MAPPING.

THE ENTRY AND MOVEMENT OF POTENTIAL DISEASE CARRIERS (USUALLY VEHICLES) IS CONTROLLED UNDER QUARANTINING WITH ENTRY BY PERMIT, WHICH DEFINES ACCESS ROUTES AND HYGIENE PROCEDURES. ALL NON-ESSENTIAL ROADS ARE CLOSED.

WASHING DOWN EQUIPMENT WAS INSTALLED AT THE SAME TIME AS QUARANTINE AREAS WERE DECLARED SO THAT VEHICLES AND MACHINERY DID NOT CARRY SOIL FROM INFECTED TO HEALTHY AREAS.

HIGH PRESSURE WATER JETS WASH THE SOIL FROM TYRES AND UNDERBODIES, LITERALLY STOPPING THE FUNGUS IN ITS TRACKS.

EXTENSIVE RESEARCH INTO DIEBACK IN WA HAS BEEN CARRIED OUT BY THE FORESTS DEPARTMENT AND SUBSEQUENTLY BY CALM AND THE DISEASE IS NOW CONTAINED IN ABOUT 14 PER CENT OF THE FOREST.

EARLY TRIALS OF THE FUNGICIDE PHOSPHOROUS ACID HAVE KILLED DIEBACK, BUT THERE'S STILL NO CURE FOR A FUNGUS FOUND OVER HUNDREDS OF THOUSANDS OF HECTARES AND MORE THAN TWO METRES BELOW THE SURFACE. APPLYING FUNGICIDES OVER SUCH AN AREA WOULD BE BOTH EXPENSIVE AND PROBABLY HARMFUL TO OTHER ORGANISMS.

UNDERSTANDING THE DISEASE IS THE KEY TO CONTROLLING IT AND WE HOPE, TO CURING IT ONE DAY.

THE APPEARANCE OF THE DISEASE IN THE JARRAH FOREST AND THEN ITS MASSIVE SPREAD HAS LABELLED THE DISEASE IN MANY PEOPLE'S MINDS AS "JARRAH" DIEBACK.

BUT THERE'S A DOUBLE TRAGEDY...THE DISEASE HAS INFECTED FAR MORE THAN OUR FORESTS AND, UNAWARE OF THIS, PEOPLE CONTINUE TO SPREAD IT.

"WILDFLOWER" DIEBACK

DIEBACK WAS UNWITTINGLY CARRIED INTO SOME NATIONAL PARKS AND NATURE RESERVES IN THE SOUTH WEST IN THE SAME WAY AS IT SPREAD THROUGH THE FORESTS.

THE IMMEDIATE THREAT TO MANY RARE AND ENDANGERED PLANTS ON THE SOUTH COAST AND NORTHERN SANDPLAINS HAS BEEN DUBBED "WILDFLOWER DIEBACK".

THE BANKSIA WOODLANDS AND HEATHLANDS WHICH EXTEND FROM EAST OF ESPERANCE TO NORTH OF PERTH ARE PARTICULARLY VULNERABLE.

SUSCEPTIBLE PLANTS, SUCH AS BANKSIAS, ARE OFTEN IMPORTANT FOOD SOURCES AND SHELTER FOR ANIMALS.

THESE INCLUDE THE HONEY POSSUM AND BIRDS, WHICH CAN BECOME HIDDEN DIEBACK VICTIMS. WHEN ENOUGH PLANTS DIE, SO DO THE ANIMALS WHICH DEPEND ON THEM.

MANY HOST PLANTS ARE NOT WIDELY DISTRIBUTED SO IT IS DOUBLY IMPORTANT TO PREVENT THE SPREAD OF DIEBACK INTO SMALL AND UNIQUE COMMUNITIES.

THE NATIONAL PARKS AND RESERVES OF THE SOUTH COAST REGION CONTAIN COMBINATIONS OF PLANTS AND ANIMALS FOUND NOWHERE ELSE IN THE WORLD.

THE FITZGERALD RIVER NATIONAL PARK BETWEEN ALBANY AND ESPERANCE, FOR EXAMPLE, IS A PARTICULARLY RICH AREA CONTAINING MORE THAN 1,700 DIFFERENT PLANT SPECIES, OR ONE FIFTH OF ALL THE PLANTS DESCRIBED IN WESTERN AUSTRALIA.

THESE UNIQUE AREAS ARE DOMINATED BY DIEBACK SUSCEPTIBLE SPECIES, SUCH AS BANKSIAS AND DRYANDRAS.

HOW DOES DIEBACK SPREAD?

DIEBACK IS KNOWN TO OCCUR IN PATCHES OVER AN AREA FROM KALBARRI IN THE NORTH TO CAPE ARID ON THE SOUTH COAST AND INLAND TO BOYAGIN ROCK, NEAR PINGELLY.

THE DEPARTMENT OF AGRICULTURE HAS ALSO HAD REPORTS OF INFECTED TOMATO PLANTS IN CARNARVON. THE FUNGUS IS THOUGHT TO HAVE BEEN CARRIED TO THIS MAJOR GROWING REGION IN INFECTED NURSERY STOCK, BUT HAS SINCE BEEN TREATED SUCCESSFULLY.

TO SPREAD NATURALLY, THE DISEASE NEEDS MOISTURE OR ROOT CONTACT; PASSING FROM INFECTED ROOTS TO HEALTHY ROOTS WHEN THEY COME IN CONTACT.

THE SMALL DIEBACK SPORES ARE CARRIED IN SURFACE WATER OR IN GROUND WATER, OR MOVE THROUGH MOIST SOIL, SPREADING QUICKLY DOWN SLOPES. DAMP, LOW LYING AREAS ARE OFTEN HEAVILY INFECTED IN THIS WAY, BUT ROOT CONTACT WILL SPREAD THE DISEASE UPHILL AS WELL.

A FAR MORE SERIOUS PROBLEM IN WA IS THE ARTIFICIAL SPREAD OF THE FUNGUS, PARTICULARLY IN SOIL CARRIED ON VEHICLES. THE POTENTIAL FROM INFECTED NURSERY STOCK SPREADING THE DISEASE IS ALSO SERIOUS.

ANY ACTIVITY WHICH DISTURBS THE SOIL CAN SPREAD DIEBACK, ESPECIALLY OPERATIONS SUCH AS ROAD BUILDING WHICH INVOLVE HEAVY EQUIPMENT MOVING LOTS OF SOIL AND GRAVEL. HOWEVER, PEOPLE AND EVEN ANIMALS CAN SPREAD DIEBACK SIMPLY BY COLLECTING A SMALL AMOUNT OF INFECTED SOIL AND MOVING IT TO ANOTHER SITE.

THE IMPACT OF DIEBACK ON SOUTH COAST FLORA COULD BE DEVASTATING, WITH SOME PLANTS ALREADY CLOSE TO EXTINCTION IN THE WILD. THIS WOULD NOT ONLY BE A GREAT LOSS OF OUR NATURAL HERITAGE, BUT TO THE MANY INDUSTRIES THAT DEPEND ON THESE PLANTS.

WHAT'S BEING DONE?

MUCH OF THE RESEARCH AND MANAGEMENT PRACTICES DEVELOPED IN THE STATE FORESTS TO FIGHT DIEBACK CAN BE APPLIED TO OUTBREAKS IN OTHER NATURAL AREAS AND TO PROTECTING UNINFECTED AREAS.

RESEARCH INTO DIEBACK IN WESTERN AUSTRALIA CONTINUES BY CALM AND UNIVERSITY SCIENTISTS. OTHER STUDIES INTO THIS FAMILY OF FUNGI IS BEING CARRIED OUT AROUND THE WORLD.

THE LATEST DIEBACK MAPPING TECHNIQUES ARE BEING TESTED ON THE SOUTH COAST USING REMOTE SENSING, WHICH PRODUCES ENHANCED INFORMATION INCLUDING INFRA RED AND THERMAL DATA. THIS DETECTS PLANT CELLULOSE LEVELS AND ANY STRESS FROM WATER LOSS, SHOWING UP INFECTED PLANTS BEFORE OTHER SYMPTOMS ARE VISIBLE.

HYGIENE MEASURES HAVE BEEN INTRODUCED FOR ALL CALM OPERATIONS, INCLUDING ROAD MAINTENANCE AND FIRE CONTROL.

OTHER CONTROL METHODS DEVELOPED IN THE FOREST AND NOW APPLIED ELSEWHERE INCLUDE IMPROVING DRAINAGE ON SOME SITES, BREEDING PLANTS WITH GREATER NATURAL RESISTANCE TO REPLACE OTHERS KILLED BY DIEBACK AND ENSURING THAT ANY WATER USED IN NATURAL AREAS IS FUNGUS FREE.

CALM MANAGEMENT PLANS FOR ALL AREAS WHERE DIEBACK IS LIKELY INCLUDE PRESCRIPTIONS FOR DISEASE PREVENTION AND CONTROL.

THE DEPARTMENT OF AGRICULTURE ALSO EMPHASISES THE NEED FOR HYGIENE, PARTICULARLY IN NURSERIES WHERE THEY ARE RUNNING A "CLEAN SCHEME" OR HYGIENE ACCREDITATION SYSTEM.

THE DEPARTMENT ADVISES GROWERS ON FUNGICIDE TREATMENTS, WHICH ALTHOUGH USUALLY EFFECTIVE, ARE TIME CONSUMING AND THEREFORE VERY EXPENSIVE IN LARGE OUTBREAKS.

DIEBACK IN SUBURBAN GARDENS IS MOST COMMON IN NURSERY PLANTS, WHICH ARE PROBABLY TOO LATE TO SAVE BY THE TIME THEY SHOW SYMPTOMS.

THE DEPARTMENT OF AGRICULTURE RECOMMENDS TREATING THE SOIL WITH FUNGICIDE BEFORE REPLACING THE DEAD PLANT. RIDOMIL IS READILY AVAILABLE, BUT ONLY IN COMMERCIAL SIZES, MAKING FONGARID A MORE VIABLE CHOICE.

PUBLIC EDUCATION IS VITAL SINCE ANY ONE OF US HERE COULD SPREAD THE DISEASE.

ROTARY INTERNATIONAL DISTRICT 9460 HAS ADDED TO CALM'S PUBLIC EDUCATION PROGRAMMES BY LAUNCHING ITS OWN DIEBACK AWARENESS CAMPAIGN.

TALKS SUCH AS THIS ARE BEING ORGANISED THROUGH EACH OF THE DISTRICT'S 40 CLUBS FROM THE PERTH METROPOLITAN AREA TO ESPERANCE.

HOW YOU CAN HELP

WE HAVE A LOT TO LOSE THROUGH THE SPREAD OF DIEBACK.

THE GREATEST SINGLE STEP WE CAN TAKE TO STOP THIS KILLER IS TO STOP ITS ARTIFICIAL SPREAD.

KEEPING TO WELL-FORMED, WELL-DRAINED ROADS AND OBSERVING ROAD CLOSED SIGNS WILL HELP DO THIS.

VEHICLE OWNERS, PARTICULARLY THOSE WITH FOUR-WHEEL DRIVES, SHOULD USE THE VEHICLE WASHING FACILITIES AVAILABLE, ESPECIALLY IF THEY ARE MOVING FROM ONE PARK TO ANOTHER. IT'S SAFEST TO AVOID PUDDLES AND MUDDY AREAS AND PLEASE CHECK WITH YOUR LOCAL CALM OFFICE TO SEE WHERE IT'S SAFE TO DRIVE OFF ROAD.

ALL CONSTRUCTION, MAINTENANCE WORK AND PLANNED ACTIVITIES IN NATURAL AREAS MUST CONSIDER THE NEED FOR CONTROLLING DIEBACK SPREAD. CALM ALREADY PROVIDES DIEBACK PREVENTION TRAINING AND ADVICE TO STAFF FROM AN INCREASING NUMBER OF LOCAL SHIRES, OTHER GOVERNMENT DEPARTMENTS AND PRIVATE COMPANIES.

THE LESSONS LEARNT FROM "JARRAH DIEBACK" SHOW THE DISEASE CAN BE KEPT IN CHECK, BUT ONLY WITH A CONCERTED COMMUNITY EFFORT.

SCIENTISTS AND GOVERNMENT WORKERS' KNOWLEDGE OF DIEBACK'S BIOLOGY AND ITS INTERACTION WITH HOST PLANTS AND THE ENVIRONMENT IS CONSTANTLY IMPROVING.

THE FIGHT AGAINST DIEBACK CAN'T BE WON UNLESS OUR KNOWLEDGE OF THE RISKS AND SIMPLE PREVENTION MEASURES IS ALSO GOOD ENOUGH.

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DIEBACK

GIVE OUR PLANTS A CHANCE

WILDLIFE AT RISK

A BOTANIST RECENTLY WARNED THAT DIEBACK COULD HAVE THE SAME IMPACT ON THE PLANTS OF WA'S SOUTH WEST AS THE LAST ICE AGE.

ALTHOUGH ONLY A PLANT DISEASE, THIS MEANS DIEBACK WOULD HAVE JUST AS DEVASTATING AN EFFECT ON OUR ANIMALS.

DIEBACK IS CAUSED BY SOIL BORNE FUNGI WHICH KILL PLANTS BY ROTTING THEIR ROOTS, STARVING THEM OF WATER AND NUTRIENTS.

IT WAS PROBABLY CARRIED TO WA AROUND THE TURN OF THE CENTURY ON TREES IMPORTED FROM INDONESIA IN HESSIAN BAGS OF SOIL.

THE DISEASE WAS UNWITTINGLY SPREAD ACROSS THE SOUTH WEST FOR DECADES BEFORE THE CAUSE WAS CORRECTLY IDENTIFIED IN 1965.

MANY OF OUR NATIVE PLANTS HAVE NO RESISTANCE TO THIS INTRODUCED DISEASE AND THE EFFECT HAS BEEN DEVASTATING IN SOME AREAS.

THERE IS NO PRACTICAL CURE FOR DIEBACK ONCE IT ESTABLISHES ITSELF IN AN AREA. FUNGICIDES CAN KILL IT, BUT APPLYING THEM OVER HUNDREDS OF THOUSANDS OF HECTARES WHERE THE FUNGUS IS TWO METRES OR MORE BELOW THE SURFACE WOULD BE EXPENSIVE AND ENVIRONMENTALLY UNACCEPTABLE.

HUNDREDS OF DIFFERENT PLANT SPECIES IN WA ARE ATTACKED BY DIEBACK, FROM EUCALPYTS AND BANKSIAS TO CAMELLIAS AND AVOCADOES.

RARE AND ENDANGERED NATIVE PLANTS ARE AMONG THE SPECIES THREATENED - SOME ARE ALREADY CLOSE TO EXTINCTION BECAUSE OF DIEBACK DEATHS.

WHAT MANY PEOPLE DON'T REALISE IS THE NUMBER OF ANIMALS THAT WILL DIE AS A RESULT OR JUST DISAPPEAR FROM AREAS WHERE THEY ARE NOW COMMON.

ALL ORGANISMS DEPEND ON ONE ANOTHER TO A GREATER OR LESSER DEGREE FOR THEIR SURVIVAL - WHEN ONE SPECIES DISAPPEARS, OTHERS ARE AFFECTED.

TAKE FOR EXAMPLE ONE OF AUSTRALIA'S MOST STRIKING PLANTS, THE BANKSIA. THERE ARE MORE THAN 50 SPECIES OF BANKSIA AND WITH THE EXCEPTION OF ONLY ONE, WHICH OCCURS NATURALLY IN NEW GUINEA, THEY ARE FOUND ONLY IN AUSTRALIA. THEY GROW NATURALLY IN ALL STATES, BUT OCCUR MOST ABUNDANTLY IN THE WEST, WHERE ABOUT 40 ARE FOUND EXCLUSIVELY.

THIS ABUNDANCE IS THREATENED BY THE PLANTS' COMPLETE LACK OF RESISTANCE TO DIEBACK.

MANY BANKSIA SPECIES FLOWER DURING LATE SUMMER AND AUTUMN OR WINTER WHEN LITTLE ELSE IS IN BLOOM, MAKING THEM A VITAL FOOD SOURCE. THEIR POLLEN AND NECTAR PROVIDES FOOD FOR A WHOLE HOST OF SMALL ANIMALS AND BIRDS, INCLUDING THE HONEY POSSUM, BLACK COCKATOO AND SEVERAL HONEY EATERS.

BIRDS NOT ONLY FEED ON THE PLANTS' NECTAR, BUT ON THE WASPS, MOTHS, BUTTERFLIES, BEETLES AND ANTS ATTRACTED TO THE FLOWERS.

THE HONEY POSSUM IS ALMOST ENTIRELY ADAPTED TO A DIET OF NECTAR, WITH BANKSIAS ONE OF ITS MAIN SOURCES OF FOOD.

THE DOORMOUSE OR PYGMY POSSUM ALSO VISITS THE BANKSIA GROVES DURING FLOWERING. THEY LIVE MAINLY ON AN INSECT DIET AND HAVE BEEN OBSERVED TO BREED WHEN THE BANKSIAS FLOWER ON THE SOUTH COAST.

BOTH POSSUMS USE ROTTED OUT HOLLOWS IN THE TRUNKS OF BANKSIAS FOR THEIR NESTS.

THE BLACKBOY IS ALSO EXTREMELY IMPORTANT TO THE FAUNA OF THE SOUTH WEST. BLACKBOYS ARE NOT NEARLY AS SENSITIVE TO DIEBACK AS THE BANKSIAS, BUT MANY HAVE DIED IN SUSCEPTIBLE AREAS WHICH FAVOUR THE DIEBACK FUNGUS.

THE BLACKBOY'S FLOWERING SPIKE ATTRACTS MANY HONEY EATERS AND LATER AS THE SEEDS RIPEN, THE PARROTS AND COCKATOOS MOVE IN.

THE MAT OF HANGING DEAD LEAVES PROVIDES A RETREAT AND NESTING SITES FOR SMALL ANIMALS, SUCH AS MARBLED GECKOES, BIRDS AND THE PYGMY POSSUM.

WHEN THE MATURE BLACKBOY DIES AND STARTS TO DECAY, IT PROVIDES FOOD FOR BEETLE GRUBS, WHICH IN TURN ARE EATEN BY THE COMMON MARSUPIAL MOUSE.

THE MOUSE EVEN MOVES INTO THE BLACKBOY STUMP, NESTING IN THE MAZE OF TUNNELS BEGUN BY THE GRUBS.

THE MARDO, OR YELLOW-FOOTED MARSUPIAL MOUSE, WILL ALSO SHELTER IN THE PARTIALLY DECAYED TRUNKS.

AS DECAY PROCEEDS AND THE TRUNK HOLLOWS OUT MORE, THE MICE VACATE THE PREMISES AND LIZARDS SUCH AS SMITH'S SKINK AND THE RED-LEGGED SKINK MOVE IN. SMALL COLONIES OF LONG-EARED BATS OCCASIONALLY MAKE A HOME IN THE HOLLOW TRUNKS.

A NUMBER OF SNAKES ARE ALSO COMMONLY FOUND IN OLD BLACKBOYS, INCLUDING THE LITTLE WHIP SNAKE, THE CROWNED SNAKE AND THE SMALL BURROWING WORM SNAKE.

ON THE SOUTH COASTAL HEATH, MUELLERS SNAKE, ONCE THOUGHT TO BE VARY RARE, IS COMMONLY FOUND IN THE BASES OF OLD DECAYED BLACKBOYS.

WHILE THE INSECTS AND ANIMALS DEPENDENT ON DECAYING BLACKBOYS CAN LIVE HAPPILY ON ONE KILLED BY DIEBACK, THE DISEASE MEANS NO NEW PLANTS WILL REPLACE IT, BRINGING THE CYCLE TO AN END.

THESE ARE ONLY TWO OF THE MANY EXAMPLES AVAILABLE OF THE WIDER COMMUNITY AT RISK FROM DIEBACK.

THE RIPPLE EFFECTS FROM DIEBACK DEATHS OF ONE SPECIES GO FURTHER.

PLANTS WHICH ARE NOT AFFECTED BY THE DISEASE COULD STILL FALL VICTIM. IF THE BIRDS WHICH FED ON INFECTED BANKSIAS MOVE AWAY, DIEBACK RESISTANT PLANTS WILL LOSE SOME OF THEIR POLLINATORS AND THEIR CHANCES OF PRODUCING NEW PLANTS WILL BE REDUCED.

IF THE NUMBER OF PLANTS KILLED BY DIEBACK IS HIGH ENOUGH, LESS WATER WILL BE DRAWN UP FROM THE GROUND AND THE WATER TABLE WILL RISE. IN AREAS WITH A LOT OF SALTS IN THE SOIL THIS MEANS INCREASED SALINITY. FOR PLANTS ADAPTED TO DIFFERENT CONDITIONS, THE INCREASED SALINITY OR EVEN JUST THE MOISTER SOIL COULD BE FATAL.

IF MORE PLANTS DIE, MORE INSECTS AND ANIMALS WILL DIE.

THE CHANGES SEEN FOLLOWING DIEBACK INFECTIONS CAN BE DRAMATIC.

IN ONE STUDY AT TWO PEOPLES BAY NATURE RESERVE, JUST EAST OF ALBANY, THE NUMBER OF SMALL BIRDS FEEDING ON PLANTS WERE RECORDED FOR AN HOUR EACH MORNING FOR EIGHT DAYS. FOUR DIEBACK SITES WERE COMPARED WITH FOUR HEALTHY SITES. THE HEALTHY AREAS BOASTED 42 BIRDS FROM SEVEN DIFFERENT SPECIES, BUT THE DISEASED SITES SAW ONLY FIVE BIRDS FROM THREE SPECIES.

PLANTS KILLED BY DIEBACK ARE USUALLY REPLACED BY OTHERS RESISTANT TO THE FUNGUS. JARRAH, FOR EXAMPLE, IS THE ONLY EUCALYPT IN THE FOREST AFFECTED BY THE DISEASE AND AS IT DIES, NEIGHBOURING MARRI TAKE OVER.

SIMILAR CHANGES - MOST OF THEM IRREVERSIBLE - OCCUR WHEREVER DIEBACK ATTACKS. THE DAMAGE TO SOME PLANT COMMUNITIES BY DIEBACK IS LIKELY TO ENCOURAGE THE INVASION OF EXOTIC SPECIES, INCLUDING WEEDS AND GRASSES ACROSS NATIONAL PARKS.

SOME ANIMALS BENEFIT. THE OPEN MARRI WOODLAND WHICH REPLACES DIEBACK AFFECTED JARRAH FOREST HAS A GROUND COVER OF SEDGE AND GRASS SPECIES, INCREASING THE FOOD SUPPLY OF LARGER ANIMALS SUCH AS THE GREY KANGAROO.

HOWEVER, THE REDUCTION OR LOSS OF A SPECIES DESTROYS PART OF OUR NATURAL HERITAGE.

AS WELL, MANY LIFE SAVING DRUGS HAVE BEEN DEVELOPED FROM PLANT MATERIAL AND THE LOSS OF ANY PLANTS COULD PREVENT FUTURE BREAKTHROUGHS.

LIKE MANY OF OUR BANKSIAS, A HUGE NUMBER OF WEST AUSTRALIAN PLANTS ARE ONLY FOUND HERE SO THEIR DISAPPEARANCE MEANS TOTAL EXTINCTION.

ONE POSSIBILITY UNDER CONSIDERATION BY THE DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT IS A TISSUE BANK OF PLANTS ON THE BRINK OF EXTINCTION. LIVING TISSUE WOULD BE KEPT IN A HERBARIUM AND RE-INTRODUCED IN THEIR NATURAL HABITATS ONCE A CURE FOR DIEBACK WAS FOUND.

THIS IS A LAST RESORT MEASURE ONLY AND CERTAINLY SECOND BEST TO CONSERVING WHOLE PLANT COMMUNITIES IN THEIR NATURAL ENVIRONMENT.

CONSERVATION NEEDS YOUR ACTIVE SUPPORT.

TO UNDERSTAND THE FIGHT AGAINST DIEBACK, IT'S ESSENTIAL TO UNDERSTAND THE WAY THE FUNGUS SPREADS AND THE WAY TO STOP IT IN ITS TRACKS.

HOW DOES DIEBACK SPREAD?

DIEBACK IS A FUNGUS WHICH NEEDS A HOST TO FEED ON AND SURVIVE.

IT'S SIMILAR TO THE FUNGUS WHICH GROWS ON BREAD OR ORANGES, EXCEPT IT GROWS IN THE ROOTS OF SUSCEPTIBLE PLANTS AND BETWEEN SOIL PARTICLES.

THE MAIN BODY OF THE FUNGUS IS A MASS OF THREADS WHICH PRODUCE TWO MAIN TYPES OF TINY SPORES IN THEIR MILLIONS.

THE FIRST IS SMALL AND CAN SWIM SHORT DISTANCES IN THE MOISTURE BETWEEN SOIL PARTICLES, OR BE CARRIED IN FLOWING WATER. WHEN THEY COME IN CONTACT WITH SUSCEPTIBLE ROOTS THEY LODGE THERE AND INFECT THE PLANT. AS THEY GROW, THEY ROT THE ROOTS AND CUT OFF THE PLANT'S WATER SUPPLY.

THE LARGER SPORE HAS A THICK WALL TO PROTECT IT FROM DEHYDRATION. THESE SPORES CAN'T MOVE ON THEIR OWN, UNLIKE THE SMALLER ONES, BUT THEY CAN BE TRANSFERRED WITH INFECTED SOIL AND ROOTS. WHEN CONDITIONS ARE FAVOURABLE FOR THE TROPICAL FUNGUS, USUALLY WHEN IT'S WARM AND MOIST IN SPRING AND AUTUMN, THE FUNGUS AGAIN BECOMES ACTIVE.

TO SPREAD NATURALLY, DIEBACK NEEDS WATER OR ROOT CONTACT; PASSING FROM INFECTED ROOTS TO HEALTHY ROOTS WHEN THEY COME IN CONTACT.

THE BIGGEST PROBLEM IN WA IS THE ARTIFICIAL SPREAD OF THE DISEASE BY THE MOVEMENT OF INFECTED SOIL BY HUMAN ACTIVITY.

UNEXPLAINED POCKETS OF DEAD JARRAH WERE REPORTED AT KARRAGULLEN, NEAR PERTH, IN 1922 AND THE MYSTERIOUS DISEASE SPREAD SLOWLY UNTIL AFTER THE SECOND WORLD WAR, WHEN IT FLARED ACROSS THE SOUTH WEST.

IT WAS ONLY AFTER THE CAUSE OF DEATH WAS CORRECTLY IDENTIFIED IN 1965 AND WITH KNOWLEDGE GAINED FROM SUBSEQUENT RESEARCH THAT THE DAMAGE DONE BECAME APPARENT.

AFTER THE WAR, THE AVAILABILITY OF EX-MILITARY VEHICLES AND TRACKED MACHINERY ALLOWED MASSIVE ROAD BUILDING AND GREATER MOBILITY IN THE FOREST. RAIL TRANSPORT OF TIMBER WAS REPLACED WITH TRUCKS ON THE NEW NETWORK OF ROADS.

ROADMAKERS UNWITTINGLY SPREAD DIEBACK BY USING GRAVEL FROM AREAS OF DEAD OR DYING FOREST, RATHER THAN CLEARING HEALTHY FOREST TO EXTRACT GRAVEL.

THERE WAS NO OBVIOUS EFFECT SINCE DISEASE SYMPTOMS ARE ONLY APPARENT SEVERAL YEARS AFTER THE ORIGINAL INFECTION.

ROAD BUILDING, PIPE AND POWER LINE OPERATIONS, TIMBER CUTTING, MINING, FIRE FIGHTING EQUIPMENT, TRACTORS AND PRIVATE VEHICLES ALL SPREAD THE UNSUSPECTED FUNGUS.

WHAT'S BEING DONE TO STOP DIEBACK?

THERE'S NO KNOWN CURE TO ERADICATE DIEBACK FROM NATURAL AREAS.

ATTACKS IN NURSERIES AND ORCHARDS CAN BE FOUGHT WITH FUNGICIDES, BUT LARGE INFECTIONS CAN BE TOO EXPENSIVE TO TREAT AND SOME COMMERICAL CROPS SHOW SIGNS OF THE DISEASE ONLY WHEN IT'S TOO LATE TO SAVE THEM.

THE ONLY PRACTICAL STRATEGY TO SAVE MANY OF OUR PLANTS IS TO STOP THE SPREAD OF DIEBACK. A COMBINATION OF PREVENTION MEASURES HAS BEEN DEVELOPED BY CALM.

Mapping

THE ESSENTIAL FIRST STEP IN PREVENTION AND CONTROL OF THE DISEASE IS THE DETECTION AND MAPPING OF INFECTED AREAS.

THE MOST DIFFICULT ASPECT OF THIS IS THE EARLY DETECTION OF DIEBACK. MAPPING BASED ON AERIAL PHOTOGRAPHY ONLY IDENTIFIES AREAS WHICH HAVE ALREADY SUFFERED A CONSIDERABLE DEGREE OF DAMAGE, OFTEN YEARS AFTER THE FIRST INFECTION.

DIEBACK MAPPING TECHNIQUES HAVE IMPROVED DRAMATICALLY OVER THE PAST 20 YEARS. THE LATEST TRIALS BEING CONDUCTED USE REMOTE SENSING, A METHOD WHICH DETECTS AND RECORDS INFRA RED AND THERMAL DATA AS WELL AS VISIBLE LIGHT.

THIS EXTRA INFORMATION SHOWS THE LEVEL OF PLANT CELLULOSE AND ANY STRESS CAUSED BY WATER LOSS - BOTH EARLY SIGNS OF A PLANT UNDER ATTACK.

Quarantine

AREAS BELIEVED TO BE AT RISK FROM DIEBACK ARE QUARANTINED TO PREVENT FURTHER SPREAD AND GIVE ANY EXISTING INFECTIONS TIME TO DEVELOP SO AN ACCURATE ASSESSMENT CAN BE MADE.

VEHICLE ACCESS IS LIMITED TO PARTICULAR TIMES OF THE YEAR ON A SMALL NUMBER OF ROADS AND OTHERS ARE CLOSED.

ACCESS BY FOOT INTO QUARANTINE AREAS IS USUALLY PERMITTED.

Hygiene

QUARANTINE AND HYGIENE ARE USUALLY ASSOCIATED WITH HUMAN MEDICINE, BUT THEY'VE PROVED TO BE JUST AS IMPORTANT TO PLANT HEALTH.

CLEAN WORK PRACTICES DEVELOPED TO MINIMISE THE CHANCE OF INFECTED SOIL BEING CARRIED INTO HEALTHY AREAS INCLUDE -

- WASHING SOIL FROM VEHICLES AND MACHINERY AT THE BOUNDARY BETWEEN INFECTED AND UNINFECTED AREAS,
- LIMITING ACTIVITIES DURING THE WET MONTHS WHEN MUD AND DAMP GRAVEL WOULD STICK TO VEHICLES, AND
- REDUCING THE AREA EXPOSED TO INFECTION BY CONCENTRATING ESSENTIAL ACTIVITIES AND ELIMINATING OTHERS.

THESE WORK PRACTICES ARE APPLIED TO ALL CALM OPERATIONS, FROM FORESTRY TO FIRE FIGHTING, AS WELL AS TO THOSE OF A GROWING NUMBER OF OTHER AGENCIES.

Research

DIEBACK IS ONE OF THE MOST WIDESPREAD PLANT DISEASES IN THE WORLD AND INTENSIVE RESEARCH HAS BEEN CARRIED OUT OVER DECADES.

HERE IN WESTERN AUSTRALIA, STUDIES HAVE BUILT UP A PICTURE OF HOW THE FUNGUS SURVIVES AND SPREADS IN LOCAL CONDITIONS.

WHILE WORK TO FIND A PRACTICAL CURE CONTINUES, METHODS OF CONTROLLING THE DISEASE ARE DEVELOPED AND IMPROVED. MANAGEMENT CONTROLS SUCH AS IMPROVED DRAINAGE, USE OF RESISTANT SPECIES AND ENHANCEMENT OF HOST RESISTANCE ARE BEING TESTED NOW.

Public Awareness

SINCE ANY ONE OF US HERE COULD SPREAD DIEBACK AS WE DRIVE TO A BUSH PICNIC OR TO COLLECT FIREWOOD IN THE FOREST, IT'S VITAL THAT WE KNOW THE RISKS.

THE CHANCES OF SPREADING DIEBACK BY STAYING ON WELL-FORMED ROADS ARE MINIMAL, BUT PLEASE OBSERVE THE ROAD CLOSED SIGNS IN DISEASE RISK AREAS THAT HAVE BEEN QUARANTINED.

ANYONE DRIVING OFF THE ROAD IN NATURAL AREAS SHOULD CHECK FIRST WITH THE LOCAL CALM OFFICE, ESPECIALLY FOUR WHEEL DRIVERS AND TRAIL BIKE RIDERS.

ALL ORGANISATIONS WHO USE OR MANAGE NATURAL AREAS MUST BE AWARE OF DIEBACK AND IT'S TO HELP BROADCAST THIS MESSAGE THAT ROTARY HAS LAUNCHED ITS DIEBACK AWARENESS CAMPAIGN, BOOSTING THE WORK ALREADY DONE BY CALM.

DIEBACK THREATENS OUR NATURAL HERITAGE AND THE PRODUCTIVITY OF MULTI-MILLION DOLLAR INDUSTRIES IN THE BUSH SUCH AS TOURISM, TIMBER, WILDFLOWER PICKING AND HONEY COLLECTION.

IT ALSO THREATENS MULTI-MILLION DOLLAR INDUSTRIES ELSEWHERE, FROM NURSERIES TO COMMERICAL CROPS INCLUDING TOMATOES, GRAPES, PLUMS, PEACHES, AVOCADOES AND ONIONS. SUBURBAN BACK GARDENS ARE NOT IMMUNE EITHER.

THE FUTURE IF DIEBACK IS ALLOWED TO SPREAD UNCHECKED IS VERY BLEAK, <u>BUT IT CAN BE CHECKED.</u>

THE PIONEERING WORK DONE IN THE FOREST, WHERE DIEBACK WAS FIRST DETECTED, SHOWS THIS CLEARLY.

DESPITE FEARS IN THE 1970s THAT THE JARRAH FOREST WOULD SOON BE WIPED OUT BY DIEBACK, TODAY THE DISEASE IS CONTAINED IN ABOUT 14 PER CENT OF THE FOREST.

IF WE CAN CONTAIN IT IN OTHER AREAS AND STOP ITS SPREAD, WE'LL GIVE OUR PLANTS A CHANCE.

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DIEBACK
GIVE OUR PLANTS A CHANCE

VIDEO

VIDEO - ENDS WITH "...IF WE DON'T STOP DIEBACK, ALL WE'LL HAVE LEFT IS PICTURES (OF SOUTH COAST FLORA)".

AS YOU'VE SEEN, THE PICTURE WE ALREADY HAVE OF DIEBACK IS BLEAK...PATCHES OF DEAD AND DYING PLANTS ACROSS THE SOUTH WEST OF THE STATE AND NO KNOWN CURE TO ERADICATE IT.

UNTIL THAT CURE CAN BE FOUND WE NEED TO BUY TIME BY PREVENTING FURTHER INFECTIONS AND SLOWING THE SPREAD OF EXISTING ONES.

THE GREATEST SINGLE STEP WE CAN TAKE TO CONTROL DIEBACK IS TO STOP ITS ARTIFICIAL SPREAD BY PEOPLE AND THEIR VEHICLES.

EXPERIENCE SHOWS THIS IS EFFECTIVE.

IN THE 1970's, THERE WERE REAL FEARS THAT THE JARRAH FORESTS WOULD BE WIPED OUT BY DIEBACK. TODAY, HOWEVER, DIEBACK IS CONTAINED IN ABOUT 14 PER CENT OF THE FOREST THROUGH A COMBINATION OF -

· RESEARCH,

· QUARANTINING OF HIGH RISK AREAS,

· MAPPING,

· MODIFIED WORK PRACTICES AND

· PUBLIC EDUCATION.

THIS LAST POINT IS A CRUCIAL ONE, BECAUSE THE FIGHT AGAINST DIEBACK WON'T BE WON JUST BY GOVERNMENT DEPARTMENTS AND SCIENTISTS.

THE DESTRUCTION WE SAW IN THE VIDEO ALONG BELL TRACK, IN FITZGERALD RIVER NATIONAL PARK, IS A GRAPHIC REMINDER OF THIS.

THE TRACK WAS NOT PUT IN BY THE PARK MANAGERS, BUT BULLDOZED ILLEGALLY IN 1971 AS A SHORT CUT TO A MINE CLAIM, AN ACTION WHICH SAW THE COMPANY PROSECUTED AND FINED.

THIS ROUGH, BOGGY TRACK HAS SINCE BEEN INFECTED BY MUD AND DIRT DROPPED FROM OTHER VEHICLES. THERE'S NOW A SIX KILOMETRE LINE OF DEAD PLANTS ALONG THE TRACK, WHICH HAS BEEN CLOSED.

THE MOVEMENT OF INFECTED SOIL AND ROOTS IS RESPONSIBLE FOR MOST OF THE DIEBACK INFECTIONS IN WESTERN AUSTRALIA.

ANY ONE OF US LOOKING FOR A SHORT CUT TO THE BEST FISHING SPOT OR JUST DRIVING INTO THE BUSH FOR A PICNIC COUD SPREAD DIEBACK IN THIS WAY.

ROAD BUILDERS, MINERS AND LOGGERS MAY DISTURB THE SOIL ON A MUCH LARGER SCALE, BUT BELL TRACK SHOWS THE DAMAGE THAT CAN BE DONE BY A FEW VEHICLES ALONG A BUSH TRACK.

THE VERY FIRST INFECTIONS WERE CARRIED INTO THE STATE AROUND THE TURN OF THE CENTURY, PROBABLY IN THE ROOTS AND SURROUNDING SOIL OF TREES IMPORTED FROM INDONESIA.

THE DISEASE WOULD THEN HAVE SPREAD NATURALLY AS THESE AND OTHER INFECTED TREES WERE PLANTED OUT ACROSS THE SOUTH WEST.

WHAT WE KNOW AS DIEBACK IS ONE OF THE *PHYTOPHTHORA* SPECIES, A FAMILY OF WATER MOULDS FOUND WORLDWIDE AND KNOWN TO ATTACK ABOUT A THOUSAND DIFFERENT PLANTS. THESE INCLUDE MANY HORTICULTURAL CROPS, SUCH AS GRAPES, TOMATOES, PEACHES, PLUMS AND AVOCADOES. *PHYTOPHTHORA INFESTANS*, WHICH IS NOT FOUND IN WA, WAS RESPONSIBLE FOR THE GREAT POTATO FAMINE IN IRELAND IN THE 1840s.

ITS IMPACT IN IRELAND AND ELSEWHERE EARNED THE FAMILY ITS NAME FROM TWO GREEK WORDS MEANING "PLANT DESTROYER".

P. CINNAMOMI, THE MOST COMMON AND MOST DESTRUCTIVE SPECIES RESPONSIBLE FOR DIEBACK, WAS NAMED IN 1922 AFTER IT WAS IDENTIFIED ON CINNAMON TREES IN JAVA. IRONICALLY THAT SAME YEAR, MYSTERIOUS PATCHES OF DEAD JARRAH WERE REPORTED AT KARRAGULLEN, EAST OF PERTH.

THESE DEAD PATCHES SPREAD SLOWLY, WITH RELATIVELY FEW NEW OUTBREAKS, UNTIL THE DISEASE FLARED ACROSS THE SOUTH WEST AFTER THE SECOND WORLD WAR.

IT WAS NOT UNTIL 1965 THAT THE CAUSE OF THESE MYSTERIOUS DEATHS WAS CONFIRMED AND THEN FURTHER YEARS OF STUDY BEFORE THE WAY IT SURVIVED AND SPREAD IN WA WAS UNDERSTOOD ENOUGH TO BEGIN TO CONTROL IT.

THE MICROSCOPIC FUNGUS PRODUCES TWO MAIN TYPES OF SPORE. ONE IS SMALL AND CAN BE SPREAD RAPIDLY BY FLOWING WATER, OR SWIM A SHORT DISTANCE IN THE MOISTURE BETWEEN SOIL PARTICLES.

THE LARGER SPORE HAS A THICK WALL TO PROTECT IT FROM DEHYDRATION. THIS MEANS IT CAN SURVIVE FOR UP TO EIGHT MONTHS IN THE SOIL, PROVIDING CONDITIONS DON'T BECOME TOO DRY.

SO TO SPREAD NATURALLY, DIEBACK NEEDS MOISTURE OR ROOT CONTACT, PASSING FROM INFECTED TO HEALTHY ROOTS WHEN THEY COME IN CONTACT.

SPREADING FROM ROOT TO ROOT IS SLOW AND UPHILL SPREAD IN THE SOIL IS ABOUT A METRE A YEAR, OR LESS IN THE DRIER CONDITIONS NORTH OF PERTH.

FLOWING WATER WILL CARRY DIEBACK MORE RAPIDLY - THE SPREAD DOWN SOME SLOPES HAS BEEN REPORTED AT HUNDREDS OF METRES A YEAR AND DOWN CREEK LINES AT SEVERAL KILOMETRES A YEAR.

THIS IS NOTHING COMPARED TO THE RATE HUMAN ACTIVITY CAN ACHIEVE - BRINGING DIEBACK FROM THE TROPICS TO THE SOUTH WEST OF WA IS THE BEST EXAMPLE OF THIS, AND OF THE NEED FOR OUR PRESENT CUSTOMS CONTROLS.

THE DRAMATIC SPREAD OF DIEBACK AFTER THE WAR WAS NOT JUST A COINCIDENCE. THE AVAILABILITY OF EX-MILITARY VEHICLES AND TRACKED MACHINERY LED TO A MASSIVE INCREASE IN ROAD BUILDING AND GREATER MOBILITY IN THE FOREST.

ROAD BUILDERS DIDN'T WANT TO CLEAR HEALTHY FOREST FOR THEIR GRAVEL WHEN IT COULD BE COLLECTED FROM ALREADY DEAD AREAS...NOT KNOWING WHAT CAUSED THE DEAD TREES MEANT THEY SPREAD THE INFECTION FOR HUNDREDS OF KILOMETRES.

THE DISEASE CAN TAKE THREE TO FIVE YEARS TO SHOW ANY VISIBLE SYMPTOMS, SO THE EFFECT OF THE ROAD WORKS WASN'T IMMEDIATELY OBVIOUS.

NOW THAT WE KNOW WHAT CAUSES DIEBACK, THE STORY IS DIFFERENT.

THE DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT (CALM), WHICH LOOKS AFTER OUR NATIONAL PARKS, RESERVES AND STATE FORESTS, HAS QUARANTINED AREAS WITH THE HIGHEST RISK FROM DIEBACK AND DEVELOPED HYGIENIC WORK PRACTICES.

QUARANTINE AND HYGIENE ARE USUALLY ASSOCIATED WITH HUMAN MEDICINE, BUT THEY'VE PROVED TO BE JUST AS IMPORTANT TO PLANT HEALTH. IN THIS CONTEXT, HYGIENE MEANS CLEAN WORK PRACTICES TO STOP THE SPREAD OF DIEBACK FROM INFECTED TO HEALTHY AREAS.

DIEBACK MAPPING NOT ONLY PINPOINTS DISEASED AREAS, AS YOU HEARD IN THE VIDEO, BUT ALLOWS ASSESSMENT OF HEALTHY AREAS SO THE MOST VULNERABLE CAN BE GIVEN SPECIAL PROTECTION.

THE LATEST MAPPING TECHNIQUE BEING TESTED IS REMOTE SENSING, WHICH CAN DETECT THE INFRA RED AND THERMAL DATA TO SHOW EARLY SIGNS OF INFECTION.

VEHICLES ARE WASHED DOWN BEFORE CROSSING THE BOUNDARY BETWEEN INFECTED AND HEALTHY AREAS, NON-ESSENTIAL ROADS AND TRACKS HAVE BEEN CLOSED AND SOME OPERATIONS ARE LIMITED TO DRY MONTHS WHEN SOIL IS LESS LIKELY TO BE CARRIED ON VEHICLES AND THE FUNGUS IS LESS LIKELY TO SURVIVE.

WATER FROM THE WASHDOWNS IS CONTAINED OR TREATED, OR IN SOME AREAS, LEFT IN LOW LYING GULLIES WHICH HAVE ALREADY BEEN INFECTED.

THIS APPLIES TO ALL CALM OPERATIONS, INCLUDING FORESTRY WORK, ROAD MAINTENANCE AND FIRE FIGHTING.

OTHER AGENCIES SUCH AS SHIRE COUNCILS, THE MAIN ROADS DEPARTMENT AND MINING COMPANIES HAVE DRAWN UP DIEBACK CONTROL POLICIES AND WORK PROGRAMMES, BUT MORE NEEDS TO BE DONE.

AS YOU HEARD IN THE VIDEO, RESEARCH HAS LED TO EXPERIMENTS WITH A DIEBACK FUNGICIDE IN NATURAL AREAS. PHOSPHOROUS ACID WILL KILL DIEBACK AND IS ALREADY USED TO TREAT DIEBACK IN COMMERCIAL CROPS. EVEN HERE, THOUGH, ITS APPLICATION IS TOO TIME CONSUMING - AND TOO EXPENSIVE - IF TOO MANY TREES ARE DISEASED.

AN ENVIRONMENTALLY ACCEPTABLE AND AFFORDABLE MEANS OF APPLICATION STILL HAS TO BE DISCOVERED IN NATURAL AREAS WHERE HUNDREDS OF THOUSANDS OF HECTARES ARE INFECTED AND THE FUNGUS HAS BEEN FOUND MORE THAN TWO METRES BELOW THE SURFACE.

RESEARCH HAS LED TO THE DEVELOPMENT OF OTHER CONTROL METHODS TO SLOW THE SPREAD OF DIEBACK. THESE INCLUDE REMOVING SOME HIGHLY SUSCEPTIBLE PLANTS TO PROTECT THEIR NEIGHBOURS, IMPROVING A SITE'S DRAINAGE AND SELECTING AND BREEDING NATURALLY RESISTANT PLANTS.

EVERYONE WORKING OR RELAXING IN THE BUSH HAS TO PLAY A PART OR THIS WORK WILL BE UNDERMINED.

IT'S VITAL THAT PEOPLE OBSERVE THE ROAD CLOSED SIGNS IN DIEBACK QUARANTINE AREAS AND STICK TO HARD, WELL DRAINED ROADS AND TRACKS WHEN THEY'RE OUT DRIVING.

IF YOU WANT TO GO OFF ROAD, PLEASE CHECK WITH YOUR LOCAL CALM OFFICE FIRST TO MAKE SURE YOU DON'T BECOME A DIEBACK CARRIER.

DIEBACK POSES A HUGE THREAT, BUT THE MAJORITY OF OUR PARKS AND RESERVES ARE STILL UNCONTAMINATED.

THE FUTURE PICTURE IS UP TO EACH OF US.

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Carriers of a deadly disease will be notified next (DAY OF MEETING) at a meeting organised by the (NAME) Rotary Club.

The disease is dieback, the fungus that is killing hundreds of native and introduced plants across the south west of the State.

(SPEAKER'S NAME) said the disease was the greatest conservation threat facing Western Australia and was still being carried and spread further by unsuspecting people.

"The disease was accidentally brought into WA around the turn of the century and widely spread before anyone discovered its cause," he said.

"The fact that it was first reported in our forests has left many people thinking only of 'jarrah' dieback, but the disease attacks a huge range of different plants.

"Those at risk range from native plants to a variety of commercial crops, such as tomatoes, grapes and avocadoes, and even those in suburban back gardens.

"Some species of banksia are already close to extinction because of dieback and there is no practical cure for the disease."

(SPEAKER'S NAME) said the soil borne fungus was most often -- and most widely -- spread by human activity.

"Heavy machinery working in natural areas and road building have been largely responsible for spreading dieback from Kalbarri to east of Esperance, with much of the damage done before the cause of the disease was known.

"Even taking the family car on a bush picnic or out to gather firewood could spread dieback unless people know what to do.

"Sticking to well formed roads and observing road closed signs in dieback quarantine areas are the simple precautions most people need to follow.

"The work done by the then Forests Department and subsequently the Department of Conservation and Land Management shows the disease can be checked."

What causes dieback, how it's spread and how everyone can play a part in stopping the disease will be discussed at next (DAY)'s meeting.

Anyone interested is invited to attend at (VENUE) at (TIME).

Western Australia's greatest conservation threat demands a community response, (SPEAKER'S NAME) from (CLUB NAME) said today.

"Dieback is killing rare and endangered native plants and threatens the productivity of many commercial crops from tomatoes to grapes," he said.

"This microscopic plant disease can be spread easily by anyone working or relaxing in natural areas so it's vital that everyone is aware of the risks and the simple precautions that can be taken."

(SPEAKER'S NAME) was speaking as part of Rotary's Dieback Awareness Campaign, launched by the 40 clubs from Mosman Park to Esperance which form District 9460.

"Dieback was probably introduced to WA on trees from Indonesia around the turn of the century before our present customs controls were implemented.

"Mysterious pockets of dead jarrah trees were first reported in 1922, but it was more than 40 years later before the cause was identified.

"During this time the unsuspected fungus was spread across a huge area of the south west of the State, mainly by people and their machines.

"The inexpensive work practices developed by the Department of Conservation and Land Management to prevent the spread of dieback must be adopted by everyone working in natural areas.

"People visiting the bush for pleasure should observe the road closed signs for dieback quarantining and stay on hard, well drained roads unless they've checked where they're going with the local CALM office.

"The cost to the community will be immeasurable unless we all help fight dieback."

A fatal disease sweeping across the south west of the State threatened family after family, (SPEAKER'S NAME) from (CLUB NAME) said today.

"The disease is dieback, something many people associate only with jarrah, not realising it kills hundreds of other native plants and others such as grapes, peaches and tomatoes," he said.

"Some of our rarest native plants are facing extinction because of dieback.

"If enough plant communities are wiped out by the disease we will also lose the native animals that depend on them.

"The cost will be even greater if productivity is affected in multi-million dollar industries including tourism, wildflower picking, honey collection and some horticulture."

(SPEAKER'S NAME) was speaking as part of Rotary's Dieback Awareness Campaign, launched by the 40 clubs from Mosman Park to Esperance, which form District 9460.

He said while there was still no practical cure for dieback, public awareness of the risks and measures to avoid spreading it was vital.

"Dieback is a fungus that lives in the soil and in plant roots. It's invisible without a microscope, making it dead easy for people to spread without knowing it.

"The Department of Conservation and Land Management has an extensive dieback programme of research and disease control, but the fight against dieback won't be won just by scientists and Government departments.

"Everyone using natural areas has a role to play.

"The greatest problem in this State is the artificial spread of dieback by people and their vehicles.

"Obviously, something like road building moving a lot of soil or gravel poses the greatest risk, but even mud carried on the wheels of the family car through the bush can spread dieback.

"The answer is inexpensive work practices for industry and simple precautions for the rest of us, including sticking to hard, well drained roads and observing the road closed signs in dieback risk areas."

Q: Is the dieback fungus like some sort of mushroom?

A: Both have characterists common to all fungi, but the fungus causing dieback can only be seen under a microscope. Its effects, however, are tragically apparent.

Q: Am I spreading dieback by driving along a forest track?

A: If the track is well formed (that is with a hard surface, no potholes and well drained) it's most unlikely that you could spread dieback further.

Q: Can I spread dieback with the firewood I collect?

A: The fungus infects the roots of susceptible plants, but can move some way up the stem. The risk of it surviving in dead, dry firewood is minimal. Driving through the bush to look for firewood can spread dieback, however, so please -

·only collect firewood from a designated CALM public firewood area (check with your local CALM office),

·don't drive off graded roads. Use a wheelbarrow to move firewood to your vehicle (you might get bogged anyway),

·don't drive into Disease Risk Areas (quarantine) which are predominately free of dieback.

Q: Is there any risk from eating fruit or avocadoes from a diseased tree?

A: No.

Q: What do I do if plants in my garden start dying?

A: Dieback, of course, is not the only cause of plant deaths so check with your local nursery or garden centre. If dieback is to blame, the disease will probably be apparent only when it's too late to save the plant. Treat the surrounding soil with a fungicide before replacing the plant. The Department of Agriculture recommends Ridomil (only available in commercial sizes) or Fongarid (available in garden packs). Follow up treatments may be necessary.

Q: Do bushfires kill dieback?

A: No, the heat from a bushfire only penetrates the top three or four centimetres of the soil, which insulates the fungus.

Q: How can you tell if a plant or tree has been killed by dieback and not by something else?

A: With great difficulty unless you're an experienced dieback interpreter. Other diseases, insect attack, fire, drought, competition, salinity, frost, mechanical damage and herbicides can all produce similar symptoms to dieback.

Q: What about the dead wood you see in tree tops - is that dieback?

A: Not usually, there's always a certain amount of dead branches due to other factors (listed above).

Q: What can we do if there's no cure -- isn't it a waste of time?

A: What we can do is contain dieback until a cure can be found. If we can stop the disease's artificial spread, we will save millions of hectares of healthy native plants and those susceptible commercial crops. sandplains, north of Perth, has members from CALM, MRD, Department of Mines, CRA, AMC Mineral Sands and Tiwest Joint Venture.

Q: How can the disease spread if there's been quarantining?

A: Quarantining was introduced to stop the artificial spread of the disease by human activity in the areas thought to be at greatest risk. Most new infections have been outside quarantine areas, but even here, dieback will still spread by natural means, either root to root contact or in water. Spreading through root contact is slow and while flowing water can carry the fungus much more rapidly, it usually takes human activity to introduce dieback into a water course. Since dieback can take up to five years to develop symptoms, infections apparent after quarantining may be quite old.

Q: What about the danger of spreading dieback through the logging CALM controls?

A: There's no doubt that dieback was spread by loggers in the days before the cause of the disease was known and even afterwards before researchers found out more about how the disease survived and spread in West Australian conditions. Effects of the disease have been recorded in the jarrah forest since 1922 and extensive research has been carried out. Hygienic work practices have been developed and -- despite fears in the 1970s that the forests would be wiped out by dieback -- the disease is contained in about 14 per cent of the forest. The procedures developed to stop loggers spreading dieback are now the model for everyone else working in natural areas.

Q: What research is being done?

A: The Phytophthora *fungi are among the most widespread plant diseases in the world and intensive research has been carried out over decades. CALM and university researchers are studying the disease in WA conditions. Current work includes trials with a phosphorous acid fungicide, control methods to minimise new infections and slow the spread of existing ones and the study of the less well known* Phytophthora *species here.*

Q: Why isn't dieback in the karri forest?

A: It is, but the infections are limited because many plants there, including karri, are not susceptible to the disease.

Q: It's all very well to wash vehicles down, but what happens to the dirty water?

A: Washdowns are strategically placed to limit the risk of carrying infected material into healthy areas. The dirty water is contained, or treated, at some stations while others are located in low lying areas already infected.

Q: Why isn't more being done to tell people about dieback?

A: CALM and one of its predecessors, the Forests Department, have been telling people about dieback for years through their own publications, the media and talks to industry and community groups. Dieback was also the theme of this year's Arbor Day. Rotary International District 9460 is boosting this effort with its own Dieback Awareness Campaign so an even greater audience can hear talks such as this.

Q: WHAT IF THERE'S A QUESTION I JUST CAN'T ANSWER?

A: IF ANYONE WANTS MORE TECHNICAL INFORMATION ABOUT DIEBACK, INVITE THEM TO RING THEIR LOCAL CALM OFFICE.

GLOSSARY

dieback: In Western Australia, the effects of the root rotting fungus *Phytophthora cinnamomi*, which causes the progressive dying from the top downward of leaves, twigs or branches.

ecosystem: A functional system which includes the organisms of a natural community together with their environment.

endemic: The occurrence of a plant or pathogen confined to a particular area.

Epacridaceae: A large plant family centred in Australia. Shrubs or small trees with small, simple heath like alternate leaves, e.g., *Styphelia*.

epidemic: An increase in disease in a population of plants in time and space.

exotic: An introduced animal, plant or pathogen to a particular area.

fungus: One of the lower forms of plant life unable to manufacture its own food that derives energy from dead or living plant or animal tissue. (Plural, fungi)

fungicide: A chemical that kills or inhibits fungi.

host: The plant or animal which is invaded by a pathogen and from which the pathogen derives its energy.

hygiene: management practices designed to prevent the transport of disease fungi from infected to healthy areas.

infection: The process of establishing a pathogenic relationship with a host.

microflora: The bacteria, actinomycetes, fungi and algae that occur in the soil.

Myrtaceae: Plant family including about 2,500 species distributed widely throughout the tropics, but particularly abundant in Australia. Shrubs or trees, eg *Eucalyptus, Darwinia, Leptospermum.*

Papilionaceae: Plant family distinguished by the butterfly-like appearance of flowers. Herbs or shrubs or trees, e.g., *Hovea.*

pathogen: Any organism capable of causing disease.

Phytophthora: "fy-toff-thor-a" (*phyton*, a plant; *phthora*, destruction) Soil borne plant disease exotic to Western Australia.

Phytophthora cinnamomi: The most destructive of the seven *Phytophthora* species present in this State.

Proteaceae: Plant family of about 1,000 species which occurs mainly in arid regions of the southern hemisphere. Commonly trees or shrubs, e.g., *Banksia, Grevillea, Hakea.*

quarantine: Restriction of vehicle access into designated areas to prevent the transport of soil from infected to uninfected sites and enable any existing infection to become apparent and observed and mapped.

remote sensing: aerial detection and recording of a site using the whole light spectrum. Unlike aerial photography, this includes infra red and thermal data which shows plant cellulose levels and heat stress, giving early warning of disease.

resistance: Ability of a host plant to suppress or retard activity of a disease.

spore: reproductive body in a fungus which can develop a new plant.

susceptibility: The capacity of a plant to become infected by a pathogen or to be affected by a disease.

systemic: Pertaining to a chemical which spreads throughout the body of a plant following absorption through roots or foliage.

DIEBACK SPEAKER'S KIT

Dieback Speaker's Kit
CALM Corporate Relations
PO Box 104
Como WA 6152

Facsimile: 389 8296

RESPONSE FORM - SPEAKER

Thank you for supporting the District 9460 Dieback Awareness Campaign. To make sure we meet your future needs and improve our support for other speakers could you please complete this brief questionnaire.

Your club: .....

Your audience: .....

Number attending: .....

Your Topic: .....

Were there other speakers? ..... Who? .....

Were you happy with the audience reaction? .....

Did you have enough information? .....

What additional information do you need? .....

Were the slides suitable? .....

Did you use supporting written material, i.e., fact sheets, brochures, etc?

.....

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Any other comments? .....

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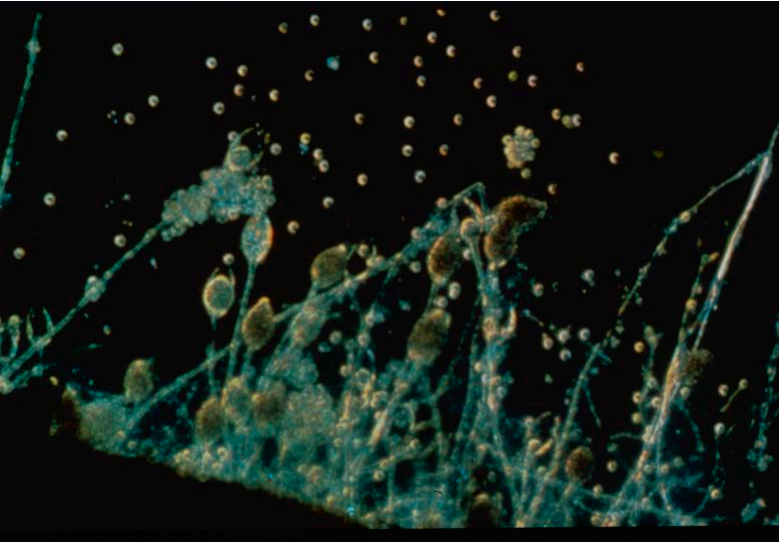
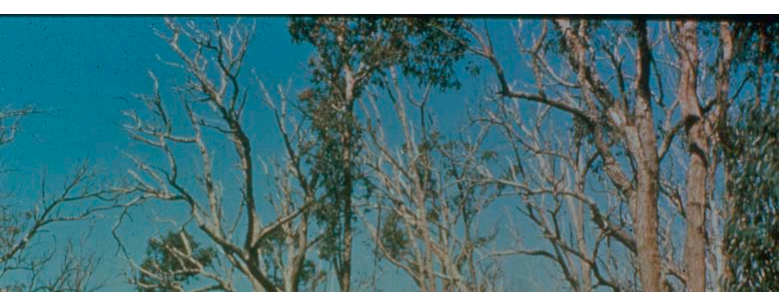
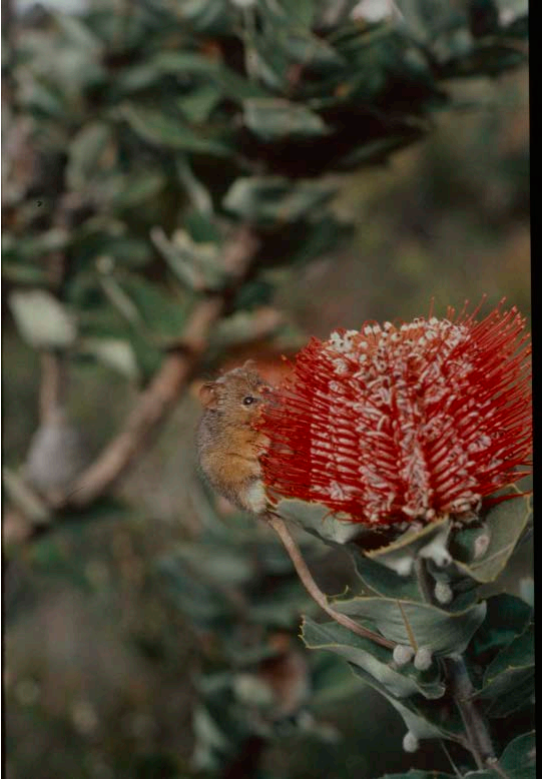
Thank you - please mail or fax to the above address as soon as possible

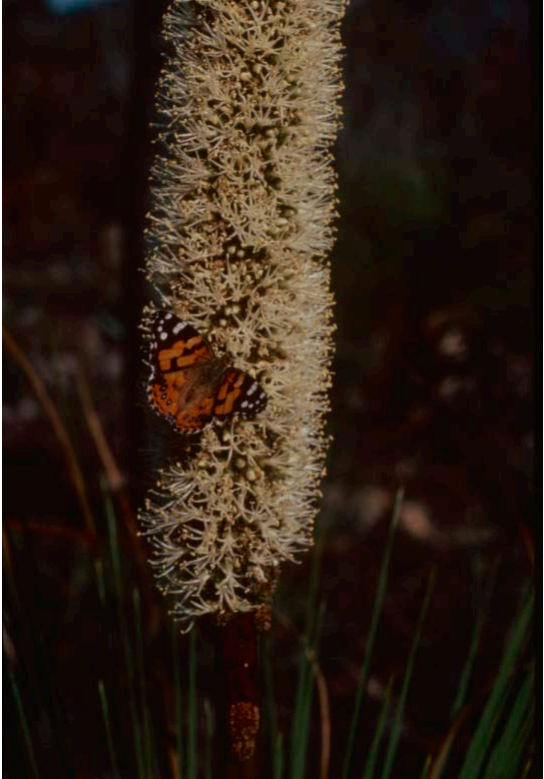

HIGH RISK PERIOD
WINTER
AUTUMN
SPRING
SUMMER

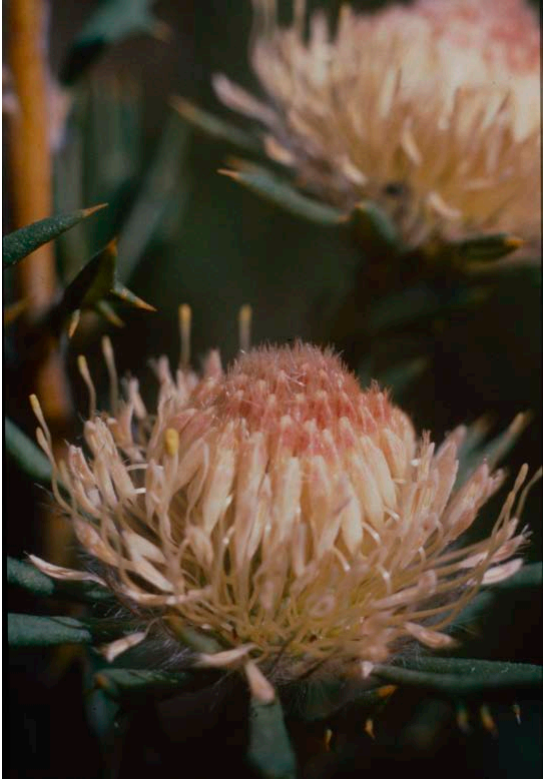


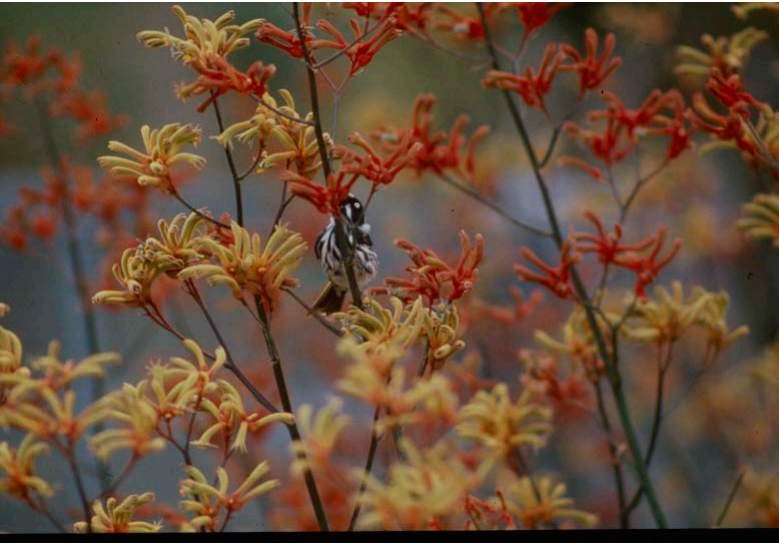


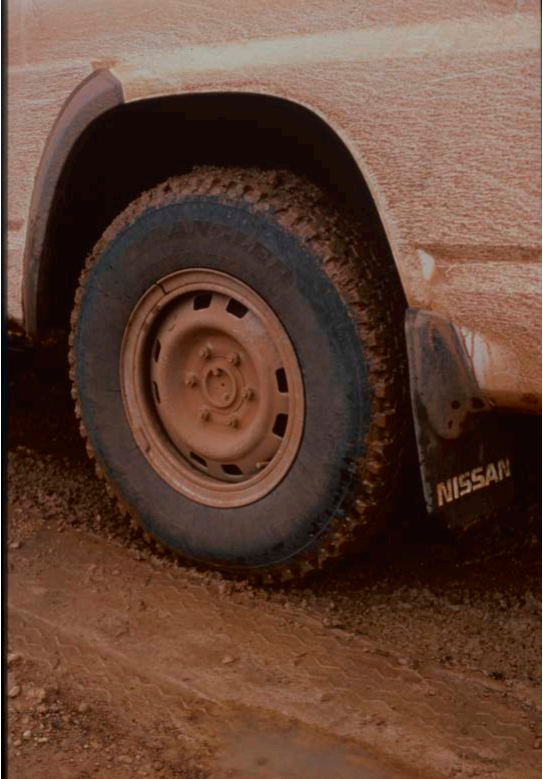

DIEBACK AREA
PEDESTRIAN
ACCESS ONLY










NISSAN


JARRAH DIEBACK
You are near a
FOREST DISEASE RISK AREA
Proclaimed in January 1976 to restrict the spread of dieback, the area is subject to
QUARANTINE procedures.
Apart from unrestricted roads, entry by
HORSE OR VEHICLE IS PROHIBITED,
but you are welcome to enter on foot.
Patrol officers may visit this site, and will b
pleased to answer your questions.