Grass Clippings

Native grasslands and grassy woodlands newsletter

April 2001 Number 13

Grass Clippings is an occasional newsletter to provide brief updates on initiatives and activities aimed at conserving and managing grassy ecosystems.
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WWF/NHT Grassy Ecosystems Grants - Second Round of Grants Announced

Successful projects for the Grassy Ecosystems Grants were announced this month. Thirty projects valued at $460,126 will be funded for this round.

51 projects were submitted for funding - 2 from ACT, 1 from ACT/NSW, 17 from NSW, 12 from SA, 6 from Tasmania and 13 from Victoria. Results were:
NSW: 10 projects funded, totalling $136,491.50
SA: 8 projects funded, totalling of $132,735
Tas: 5 projects funded, totalling $25,400
Victoria: 7 projects funded, totalling $165,500.

The Federal Minister, Robert Hill, has also given in-principle support for the allocation of $162,088 to 5 further projects to be targeted and re-worked through a limited supplementary assessment process as suggested by the National Assessment Panel.

Here's a sample of some projects that were funded:

Conservation of Travelling Stock Routes (TSR's) Grassy Ecosystems in southwest NSW
This project aims to conserve 28 grassy ecosystem sites on TSR's in SE NSW. Joint management agreements will be negotiated for the sites to ensure long term protection. Interpretative material (signs and brochures) will be provided. Conservation management practices will be implemented.

Management of Significant Grassy Reserves - Northern Areas Council, SA
Five reserves containing significant grassy ecosystems will be managed through the development of Friends groups, site management plans and on-ground works such as weed removal. Additional council reserves will also be identified and the management needs of these sites determined.

Protection of Threatened Sheoak Grassy Woodlands on the Western Eyre Peninsula, SA
On Western Eyre Peninsula there has been a dramatic decline in the condition and extent of Sheoak Grassy Woodland. This project aims to protect and restore remnants through fencing and appropriate management.

Management Planning for Tasmanian Grassland Threatened Species Sites
This project will produce management plans for 15 cemeteries in Tasmania that contain significant populations of threatened grassland species. A range of management agreements will reinforce these management plans. Information on these species will be made available to the congregation to encourage community action and ownership.

Tundridge Tier Rd Stock Reserve to Private Nature Reserve - Northern Midlands Council, Tas.
A stock reserve along the Tundridge Tier Road traverses 5km of native grassland. The landowners are willing to have the land designated as a Private Nature Reserve and covenant it. DPIWE will help to manage the reserve. The grasslands are in excellent condition and support a number of threatened species. The funds will be used to purchase herbicide, establish a monitoring program, and erect a fence and signs.

Victorian Riverine Plains Protected Area Network Project - Trust for Nature, Victoria
This project aims to protect the highest priority grassy ecosystems in the Goulburn Broken and North Central Catchment Management Authority areas. This will be achieved by the employment of two Protected Area Network Coordinators with specific geographic foci in currently identified priority areas. Success will be achieved by provision of incentives specifically designed to optimize involvement and success with private landholders.

Congratulations to the successful applicants and thank you to all who applied for the grants. While there were fewer applications than in the first year, the standard was undoubtedly higher.

Minister Hill has approved the continuation of the program for another year through the allocation of $500,000 for a third round. This round will open for Expressions of Interest on 4 August 2001.

Railways - surveys and other activities

Major freight lines in the north of the State were surveyed in October, and surveys of lines in central

Victoria, the south-east and part of the south-west were undertaken during late spring and early summer. For the 2000 survey it was decided that the standards used by Doug Frood in his 1985 survey needed to be lowered to accommodate the overall lower quality of remaining sites.

Despite the presence of access tracks along most rail lines, travelling these tracks by car proved to be very time consuming and in many places impossible. Therefore a Hi-rail which travels on the actual train tracks was used to carry out the initial surveys of the rail reserves.

Arrangements were made to travel by Hi-rail with the line inspection crews on their regular inspections. This worked well and all the railway people, District Engineers, Maintenance Supervisors and Line Inspectors were very helpful and obliging.

Significant sites of all vegetation types were assessed and the information has been entered on NRE's Biosites database. Where endangered or vulnerable species were found, details of population size and location within the remnant were made and the information was later entered into the NRE VROTPOP Database.

NRE and the Victorian Rail Track Corporation, who provided financial assistance with the surveys, are sharing this information and discussing roles and responsibilities for management of these sites.

Priorities for surveys were on the lines between Melbourne and Ballarat, Bendigo, Geelong and Traralgon, which will be ungraded for the new Regional Fast Rail links. Staff from the Department of Infrastructure who are planning these works, have been keen to get the survey results so that works can be designed to avoid or minimise environmental damage along the lines.

Evans Deakin Industries, the primary maintenance contractor for Victorian rail lines, has also been in close contact with NRE, requesting advice on weed control and herbicide management, signposting significant sites and environmental training.

Unfortunately damage is still occurring. North of Seymour, large areas of remnant native vegetation on rail reserves was graded and destroyed, and graded material spread on the rail reserve and adjacent road reserve. Hopefully the climate of improved communication and cooperation with EDI will help to prevent this sort of thing being repeated.

Hume Freeway - Craigieburn Bypass

The State Government has released its final proposal for the Craigieburn-Bypass section of the Hume Freeway. A string of extremely important grassland areas exist in this part of the Merri Creek Valley. They include some of the largest and most diverse remnants of the natural vegetation of the Victorian Volcanic Plains.

While the new freeway proposal will reduce the impact on conservation values compared to earlier routes, it will do little to actually protect these highly significant grasslands.

The VNPA and the Friends of Merri Creek have proposed that a Merri Park be created, based on the existing Craigieburn Grassland Reserve, to protect the values of these sites. VNPA says that it will continue to press for proper protection of the grasslands of the Merri Creek.

Keilor Plains Grassy Ecosystems Reference Group

A Keilor Plains Grassy Ecosystems Reference Group has been formed to develop a collaborative approach to grassy ecosystem conservation in this complex region. Organised along the same lines as the successful Merri Plains GERG, the KPGERG aims to develop collaborative approaches to grassy ecosystem management and conservation. Its goals are to:

- encourage a coordinated approach to grassy ecosystem conservation on the Keilor Plains, including cooperation and communication between government and non-government sectors;
- provide a forum for exchange of information and ideas between a range of stakeholders; and
- foster partnerships between organisations to achieve common goals in grassy ecosystem conservation.

The group will be informal and will meet quarterly. Those invited will include NRE, Parks Victoria, Port Phillip CALP, Trust for Nature, VNPA, Victoria University, local governments, interested "Friends" and Landcare groups, and other organisations and key private landholders from time to time as the situation requires.

For more information about the KPGERG contact Colin Hocking at Victoria University St Albans campus colin.hocking@vu.edu.au, phone (03) 9365 2322; or the *Grass Clippings* editors.

Region Snapshot - Keilor Plains

The Keilor-Werribee Plains were formed by a series of lava flows from 1 to 5 million years ago. They are part of a much lager basalt plain that extends from the Merri Creek, north of Melbourne, to Hamilton in the Western District. Rainfall on the Keilor Plains is low compared with surrounding areas (450 - 550 mm p.a.). The soil is fertile and surface rock is generally abundant.

Species-rich grasslands, dominated by Kangaroo Grass with a variety of daisies, lilies and other herbs, were widespread on fertile well-drained soils.

Native grasslands on the Keilor Plains fall generally into three main categories:

- Small linear remnants on rail and road reserves.
- Various mid-sized remnants, often council owned with varying management histories (eg. Old Sunshine Tip, Evans St Grassland in Sunbury)
- Large sites with a history of grazing.

Expanding residential and industrial development is currently the major threat to native grasslands on the Keilor Plains.

National Estate nominations

Grasslands of the Terrick Terrick National Park and the Munro rail reserve are being considered for listing on the Register of the National Estate.

Forthcoming Conference

Stipa Native Grasses Association Second National Conference: “Our Valuable Native Grasslands, Better Pastures Naturally”.

Planning for the second *Stipa* conference is well underway. The conference will be held on 27-28 September 2001 at Dookie College in NE Victoria. Themes will be **Conservation, Grazing** and **Water Use.**
Key issues on the conference agenda are:

- The role and management of native grasses in agriculture.
- Managing native pastures for productivity with conservation.
- Why biodiversity matters.
- Regenerative agricultural practices.
- Latest developments in native grass technology.
- Pasture cropping.
- Salinity and water use in native grasslands.
- The economics of establishing and managing native grasslands for production and conservation.

Conference details, program and the registration form can be found on the *Stipa* website, www.coolahddg.com.au/stipa.

Biological Control of Serrated Tussock and Chilean Needle Grass

GrassEcol recently reported that the Rural Industries Research & Development Corporation (RIRDC) has published a report on “Biological Control of Serrated Tussock and Chilean Needle Grass”, by D.T. Briese, W. Pettit & F. Anderson. The report describes preliminary investigations in South America aimed at identifying natural enemies of these two weeds and performing experiments to determine their potential for biological control in Australia.

You can download the full report from the website
http://www.rirdc.gov.au/reports/Ras/01-27.pdf
or the summary from
http://www.rirdc.gov.au/reports/Ras/01-27sum.html

Calling volunteers

VNPA is seeking volunteers to undertake a variety of grassland projects. The first project is already underway, with Karl O'Keefe working on case studies of grassland remnants that have been preserved as open space contributions from developers. These remnants become surrounded by residential or industrial developments, with subsequent management difficulties. This project will seek to determine whether such sites maintain their values following development, to identify the best strategies for maintaining site values, and suggest improvements. We will then have an idea of whether setting aside an important remnant as an open space contribution is enough.

For further information contact Helen Ryan.

Guide to developing regional vegetation management plans

From David Eddy, Monaro Remnant Native Grasslands Project, WWF, 15/71 Constitution Avenue Campbell ACT 2612 ph. 02 6257 4010 email deddy@ozemail.com.au

The World Wide Fund For Nature Australia has released a step-by-step guide to take the confusion out of regional vegetation management planning.

The report, "Regional Native Vegetation Management Plans: A Model", provides both a model and a step-by-step guide for communities developing regional vegetation management plans.

The report is based on the work and experience of regional vegetation committees that have already produced regional vegetation management plans. It is intended for use as a guide for States and regions that are starting to develop plans, or wish to evaluate and revise existing plans.

Copies of the report are available from Alecia Jones at alecia@wwf.org.au or may be downloaded from www.egroups.com/files/mdbnewsline/vegetation.
For further information, contact Pip Walsh, Program Manager on (02) 9281 5515 or 0410 511 779 or Jamie Pittock on (02) 6257 4010 or 0409 921 284.

Contribution:

“The Great Salinity Debate: Part II - Why the recharge-discharge model is fundamentally flawed”

by **Christine Jones,** Rangelands Officer, DLWC, PO Box 199a, Armidale NSW 2350 e-mail: cjones@dlwc.nsw.gov.au

The recharge-discharge model which has been used to describe the changes in water balance since European settlement is based on false assumptions concerning i) the nature of pre-European vegetation and ii) the way water moves in the landscape. The use of this flawed model as a basis for strategies to combat dryland salinity underpins the poor success rates achieved to date.

Native vegetation

We hear a lot about the clearing of native vegetation in relation to dryland salinity. Most people assume that the words "native vegetation" mean "trees and shrubs". Contrary to popular opinion, the historical record clearly shows that in the early years of European settlement many of the higher rainfall areas of temperate Australia were grassy woodlands, that is, widely spaced trees with a grassy understorey.

The explorers and early surveyors described the richness and diversity of this vision splendid, with grasses frequently up to their horses' bellies. Many of the hills were recorded as being grassed to their summits, having only thinly scattered trees, or being treeless. The descriptions of the grassy vegetation were remarkably similar across the temperate parts of eastern, southern and south-western Australia, and the comment was invariably made that, unlike many parts of America where clearing was a pre-requisite, here most of the land was immediately ready for grazing or the plough.

Early settlers could not have anticipated the rapid deterioration in the quality and diversity of groundcover and the decline in soil quality that accompanied European style grazing and cultivation. In parallel with the loss of grassland habitat was the extinction of 20 previously common species of small marsupials and the near extinction of a myriad of others. The significant role that these native fauna played in soil enhancement is not widely recognised. In combination with the cessation in aboriginal burning and soil disturbance regimes, the widespread loss of the thousands of small animals that loosened soil, buried organic matter and consumed emerging tree seedlings, produced massive changes to the ecology of the Australian landscape. So much so that today's "remnant vegetation" probably bears little resemblance to the plant communities in existence 200 years ago.

Europeans were caught unawares by the sudden explosion in the numbers of trees and shrubs which followed settlement. In 1848, Thomas Mitchell, Surveyor General for NSW, described *"thick forests of young trees, where, formerly, a man might gallop without impediment, and see whole miles before him".* Observations of regrowth were reported many times thereafter by other observers across southern Australia. For example, Howitt (1890) described the tree regrowth in Victoria *"…After some years of occupation, whole tracks of country became covered with forests of young saplings…and at present time these have so much increased, and grown so much, that it is difficult to ride over parts which one can see by the few scattered old giants were at one time open grassy country".* Subsequent generations found it necessary to clear this regrowth in order for agricultural activities to proceed.

The changes in the quality and quantity of the groundcover since European settlement have had enormous implications for water balance in the Australian landscape. The diverse perennial grassland communities which proved so productive for early settlers could respond to rain at any time of the year. Furthermore, the soil organisms which proliferated in response to the high root biomass and the activities of the grassland fauna, produced humic materials and microbial gums which glued soil particles together, creating a crumb structure which resisted erosion. Soil microbes also produced plant growth hormones which stimulated root growth and enabled plant roots to penetrate clay subsoils. The many pore spaces in these healthy, living soils enabled them to hold large volumes of water.

The movement of water in the landscape

Dryland salinity is the result of a water cycle that is out of balance. The salt is an unwelcome fellow traveller with rising groundwater, and even though serious in its own right, salinity is merely an indicator of a more deep-seated problem. It is therefore extremely important that we look very carefully at what **is** happening at the landscape level, sooner rather than later.

In comparison with pre-European times, there is now LESS water entering **aquifers** in the HIGHER parts of the landscape (and hence LESS **fresh groundwater** available to feed springs and streams), MORE **runoff** and lateral **subsurface flow** on undulating country (which may be intercepted by dams and contour banks and may not necessarily reach rivers other than in periods of high rainfall) and MORE **recharge** to water tables in the LOWER parts of the landscape (Fig.1, Part B).

This is almost the opposite of the widely accepted recharge-discharge model on which most salinity "solutions" are based. The recharge-discharge model depicts MORE water entering deep drainage in the higher parts of the landscape with the removal of the original native vegetation, which is assumed to be trees, which in turn are assumed to be deep rooted. This excess water then apparently travels underground, collecting salt along the way, to emerge as discharge at the break of slope or in low-lying areas (Fig. 1, Part A). Although the model appears seductively simple, there are no biological or physical mechanisms by which these processes can occur at the landscape or regional scale.

"Recharge" in the upper catchment

Imagine that you're standing on the side of a fairly steep hill in the pouring rain. The hillside is completely bare. Where does the water go? Straight down the side of the hill, taking soil with it. Not directly **into** the soil and into "deep drainage" as the recharge model tells us will happen if there are no trees. Any water that does infiltrate will also run downslope on top of the subsoil as lateral flow, under the force of gravity. If there are rocky outcrops, some water will seep through cracks, but this will only account for a small percentage. The remaining water has no mechanism for becoming recharge until it reaches the lower parts of the catchment.

Now imagine that there are trees on the hill, but no grasses or other groundcover. Where does the water go? Again, straight down the side of the hill, perhaps a little more slowly. If there's leaf litter, at least some of the rain will infiltrate, but it will then also travel as lateral flow unless the soil is high in organic matter.

Finally, imagine that the hill is covered with dense tussocky perennial grasses which have deep, fibrous root systems. The soil is well mulched and you can't see any bare ground. Where does the water go? The V-shaped grass architecture, in combination with high levels of organic matter both in soil and on the friable soil surface, will facilitate the rapid infiltration and storage of rain as it falls. The chance of water moving downslope will be significantly reduced. The water held in pore spaces between soil aggregates in the root zone will be available for later use by the grassland plants and the soil community of invertebrates and microorganisms.

A small amount will slowly percolate through the subsoil (or enter cracks in the parent material) and provide clear, filtered water for springs and streams. It is extremely important for future generations that this process continues. When the water runs on the top of the ground instead, or on top of the subsoil, we get into the all too familiar flood/drought cycle, with rivers carrying either too much or too little water, while freshwater aquifers are shrinking.

Recharge in the lower catchment

The conventional recharge-discharge model has provided landholders in the lower parts of the landscape with a scapegoat for their own inappropriate (although unintentional) land management practices. Where there are annual crops or pastures, or where perennials are overgrazed, enormous amounts of water enter the groundwater below the break of slope. Despite this, the tendency has been to point the finger at others higher in the catchment and blame them for all the recharge.

Certainly, some water has travelled downslope, but the lower parts of the landscape normally account for the major portion of the total land area, as well as for most of the recharge if conventional cropping or conventional grazing are the major land uses. The fact that the eruptions of saline water are often at the break of slope doesn't necessarily mean that all of the water came from above – it simply means that the rising groundwater put backward pressure on any water moving downhill and there was nowhere else for it to go. This phenomenon can be demonstrated by placing a piezometer above the high water mark on the beach. As the tide comes in, the water level rises in the tube. If you were only observing the water level in the piezometer and couldn't "see" the tide coming in, it would be natural to assume that the water had moved downslope from the sand dunes behind.

In the lower parts of the landscape, fibrous-rooted perennial grasses and associated organic components will again hold most of the rainfall in the root zone, where it can increase the productivity of a wide range of enterprises. Remember, a pulsed grazed native pasture base will be more nutrient and water efficient than a high input introduced pasture and will complement, rather than compete with, cropping, viticulture, horticulture or silviculture. If the main land use is grazing, a diversity of cool season (C3) and warm season (C4) perennial native grasses will provide year round productivity, stability and drought tolerance, provided the management is appropriate (refer Part I this series). A small amount of water will still go through to deep drainage, but that's what was happening 200 years ago.

Discharge

The rate of movement of water in underground aquifers depends on many factors, but in most situations takes between 300 and 1000 years to travel one kilometre. For water to travel 50 km underground could take up to 50,000 years. If you have saline discharge on your property, the chances are that recharge also took place there. The good news with respect to this local hydrology scenario is that landholders can have some control over their own destiny where dryland salinity and other land degradation processes are concerned.

In some places freshwater aquifers are drying up while saline water tables are expanding. How could those two things be happening at the same time? It can be explained quite easily if the recharge-discharge model is in fact upside down. The conventional model states that recharge occurs high in the catchment and discharge occurs lower down. The available evidence suggests that there is very little true recharge at the top (albeit too much lateral flow, which adds to the discharge at the bottom) and that **both** recharge and discharge are occurring in the lower parts of the landscape. Unfortunately this has resulted in some of the freshwater aquifers beginning to backfill from enlarging saline aquifers below.

The current situation

The recharge-discharge model as shown in Fig.1 (Part A) is being taught in schools across Australia today. A whole generation of children will grow up believing that it is their duty to plant trees in the upper parts of the landscape to "prevent recharge". Meanwhile, dryland salinity will continue unabated.

Furthermore, our children are being led to believe that all trees have deep tap roots, as depicted in salinity models. The tap root of the seedling tree degenerates over time, and although some fine roots may occasionally follow rock fissures, most mature trees of the species commonly found on hillsides do NOT have a tap root. More usually, up to 90% of the root mass is concentrated in the top 50 cm of the soil profile. Once the water has run off a hillside covered in trees, there is no way the trees can get it back.

The recognition of urban salinity as a mostly local hydrological phenomenon has clearly demonstrated that we don't need a fool on the hill, or even a hill, or even an agricultural landscape, to encounter water balance problems. In the urban context, dryland salinity results from the combined effects of activities such as watering shallow rooted lawns (all short grasses are shallow rooted) and rain falling on impermeable structures such as rooftops, paths, driveways and roads, and becoming runoff. That is, urban salinity is the result of excessive runoff added to excessive recharge *in situ.*

I fail to see much difference between this and the expression of dryland salinity in agricultural landscapes. Planting trees on a hill 20 km away will do little to resolve the problem in either the agricultural or the urban context. Trees and shrubs form an integral and ecologically valuable component of grassy woodland vegetation and I am by no means dismissing their importance. My concern is with the promotion of broadscale tree planting (mostly same-age monocultures) as a panacea, not only for dryland salinity, but for all land degradation problems. In a healthy perennial grassland soil, there may be 50 tonnes of biomass (roots, soil organisms and humic materials) below ground for every tonne of biomass above ground. In forests, there is far more organic material above ground than below. The fact that we can only see the biomass above ground may explain the distorted image many people have of these respective plant communities.

We certainly do have to mimic the native vegetation to restore hydrological balance, but let's get the facts right. The vegetation of the temperate zone was almost exclusively perennial 200 years ago, but Australia was not a forest. The majority of aboriginal people were not forest dwellers. Neither do we have to be. How many rural communities will be lost in this mad rush to return Australia to a land of trees we never had?

The aboriginal people lived in a diverse and dynamic grassy ecosystem. So can we. Grasslands produce more food than forests and the intuitive response would be to manage the landscape to favour grassland species. To refer to the pre-European vegetation as "natural" or "pristine" totally ignores thousands of years of prior habitation, exceptional observational skills and active management to achieve desired outcomes. Australia has been mismanaged for the last 200 years. Now it's crunch time.

In our low and variable rainfall environment, the increasing reliance on high water use plants or engineering solutions to "dewater" soils makes neither ecological nor economic sense. We can restore water balance and improve soil health, nutrient cycling and productivity if current agricultural and horticultural activities are conducted in an appropriately managed perennial groundcover base. That's the topic for the next issue.

Acknowledgments

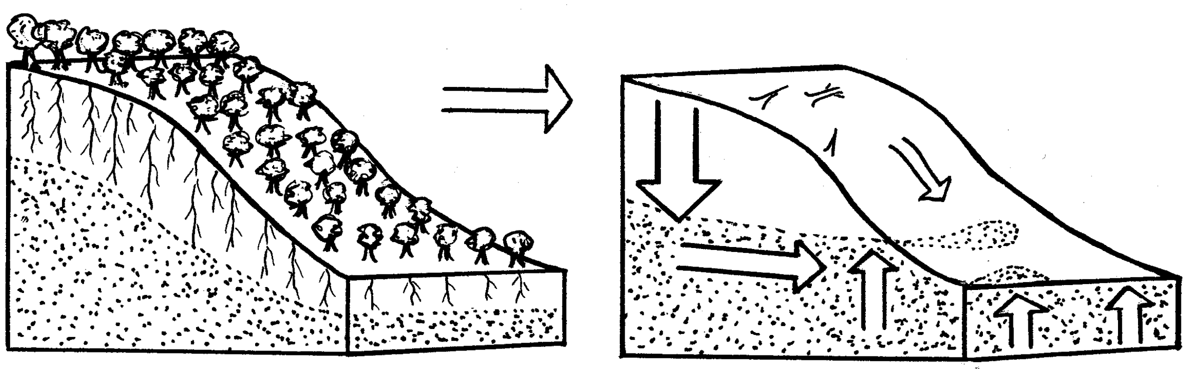
The compilation of this article would not have been possible without the vision, critical thinking, historical perspective and encouragement provided by many people. While all errors in interpretation are mine, I am particularly indebted to Allan Savory, Darryl Cluff, Greg Martin, Stephen Hailstone, Wal Whalley, Pam McGregor and Bruce and Suzie Ward.

This article was also in the *Stipa Newsletter No. 14, pp. 9-12*

Fig.1. ***A: the widely promoted recharge-discharge model of dryland salinity B: a more realistic model***

A: the widely promoted recharge-discharge model

Prior to Settlement | **Today**

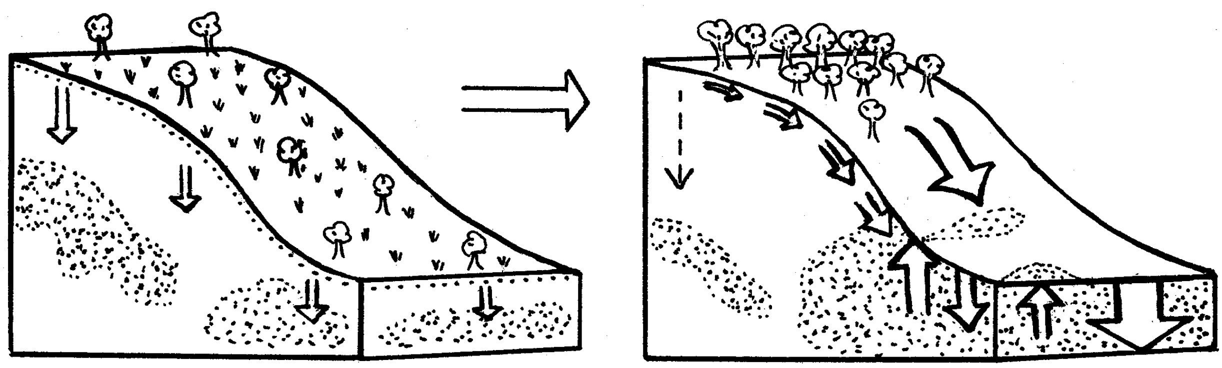


Deep rooted trees USE large amounts of water and keep water table in balance.

Tree removal results in water table recharge in upper catchment and discharge in lower catchment.

B: a more realistic model

Prior to Settlement | **Today**



Healthy perennial groundcover, fibrous root mass and associated humic materials HOLD water where it falls with some percolation to groundwater.

Loss of healthy groundcover in both upper and lower catchments results in more runoff, lateral flow, recharge and discharge. Replenishment of elevated aquifers may be reduced.