MARY RIVER CATCHMENT COORDINATING COMMITTEE

Natural Heritage Trust
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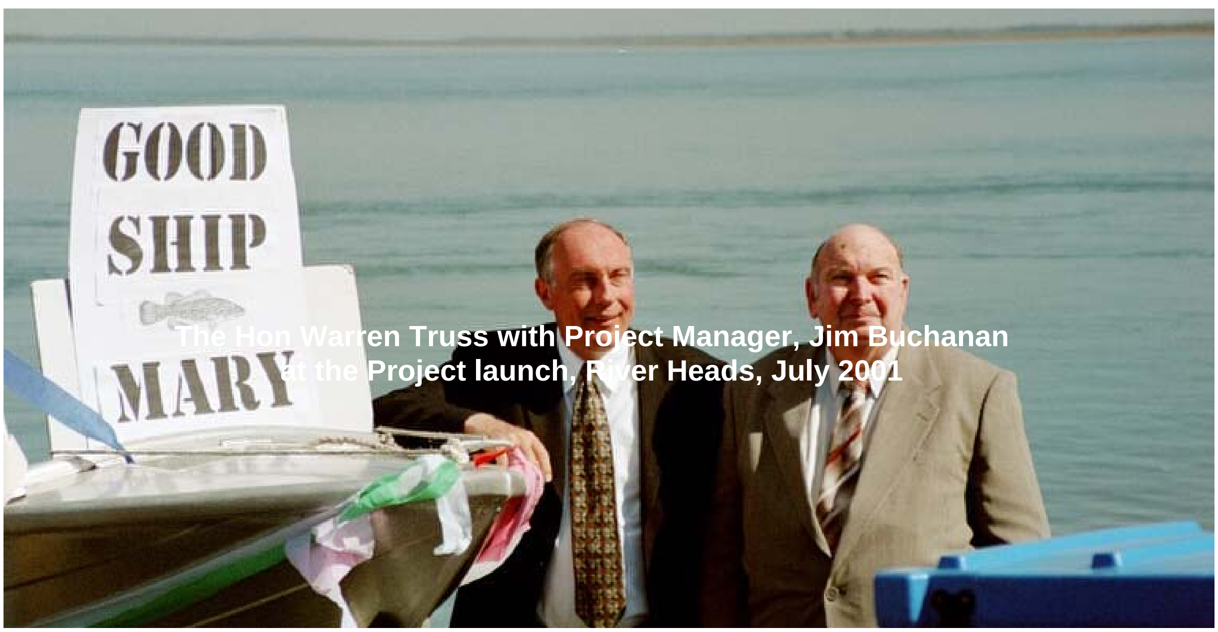
IMPLEMENTING THE MARY RIVER & TRIBUTARIES REHABILITATION PLAN

MONITORING & EVALUATION REPORT 2003



The Hon Warren Truss with Project Manager, Jim Buchanan at the Project launch, River Heads, July 2001

Dairy Farmers
CALOUNDRA CITY
MARYBOROUGH CITY COUNCIL
SHIRE OF KILKIVAN
Maroochy Shire Council
COOLOOLA SHIRE COUNCIL
NOOSA COUNCIL

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- Department of Primary Industries
- Environment Protection Agency
- Queensland Parks & Wildlife Service
- All the landholders involved in the project

THE MARY RIVER CATCHMENT:

1) INTRODUCTION

The Mary River Catchment Strategy by the Mary River Catchment Coordinating Committee states that "education and awareness, designed to bring about voluntary activity by our catchment population, is the best possible approach" to good catchment management and will only come about by working in a series of productive partnerships (MRCCC, p.1).

The Rivercare Grant Scheme encompasses this vision. Productive and valuable voluntary partnerships between the MRCCC and landholders are formed through the processes of the Rivercare program.

Monitoring and evaluation of the Rivercare Grant Scheme is an essential component. Monitoring and evaluation not only observes the landholders project commitment, but also promotes further education and awareness of riparian issues with the landholder and the wider community.

The Rivercare Grant Scheme is a significant part of a Natural Heritage Trust & Local Government funded project called "Implementing the Mary River & tributaries Rehabilitation Plan". This project is aimed at:

- Providing direct financial incentives to landholders for practical on-ground actions to protect, rehabilitate and manage watercourses.
- Offering practical advice and assistance to landholders regarding the Community Rivercare Plans, and provide increased awareness of Rivercare issues.

1.1) Aims

As the monitoring & evaluation component of the Rivercare Grant Scheme this report aims to:

- Assess Rivercare Grant properties using the Index of Stream Condition (ISC [developed by the Department of Natural Resources and Environment, Victoria]) in order to assess the physical parameters influencing: vegetation health, stream bank stability and instream health of the monitored sites.
- Assess riparian plant species diversity and condition using the Corridors of Green (COG) data sheet (developed by Green Australia Tiaro) in order to assess riparian vegetation condition and diversity.
- Gauge landholder attitudes and commitment to the Rivercare Grant Scheme via an attitudinal survey.
- Establish sets of baseline data and scores to be used for comparisons over time.
- Establish a fixed methodology for the Rivercare Project sites monitoring procedures.
- Offer practical advice and information on issues highlighted by the monitoring, in order to correctly maintain the project.

1.2) Project Outcomes at a Glance (2000-02)

Activities undertaken through Rivercare Grants Scheme	Amount
Remnant Protection Works (hectares)	221
Remnant Rehabilitation Works (hectares)	600
Revegetation Works (hectares)	66
Number of native riparian seedlings established	73 460
Distance of Riparian Fencing erected (metres)	72 515
Area of Voluntary Management Agreements established (hectares)	719
Area of Covenants established (hectares)	58
Area of Threatened Species habitat protected (hectares)	130.5
Number of head of cattle excluded from the riparian zone	2600
Number of off-stream watering points installed	65
Area of woody weed control performed (hectares)	90
Total Riparian Rehabilitation generated	**$626 613**
In-kind Riparian Rehabilitation generated	**$428 797**

1.3) Streams Monitored using ISC & COG Assessment

(between December 2002 to February 2003)

Monitored Sites	Stream	Stream Priority according to the Mary River & tributaries Rehabilitation Plan
CED26 GER1 BEL0 KIL11 BAL11	Upper Cedar Creek Upper Gerhaghtys Creek Mid Belli Creek Kilcoy creek Balgowalah Creek	Priority 1
MAR24	Upper Mary River	Priority 2
OBI19 OBI25 ZAC17 SIX10-HF SIX10-BF PIN28 SLA31	Upper Obi Obi Creek Upper Obi Obi Creek Zachariah Creek Upper Six Mile Creek Upper Six Mile Creek Pinbarren Creek Slatey Creek	Priority 3
SIX20-SS SIX20-RA MAR21 WON6 WID8 MAR9	Lower Six Mile Creek Lower Six Mile Creek Mid Mary River Wonga Creek Lower Widgee Creek Lower Mary River	Priority 4
MAR4	Mid Mary River	Priority 5

1.4) CSIRO SEDNET MODELLING for MRCCC RIVERCARE PROJECTS

Scenario: Impact of MRCCC Rivercare Devolved Grants/year – modelling provided by Ian Prosser, using the CSIRO Land & Water Sednet Model.

Present modelled sediment yield = 445 000 tonnes / year
MRCCC Devolved Rivercare Grants Rehab = 419 000 tonnes / year (6% reduction)

Total Nitrogen export: Current - 1541 tonnes /year

MRCCC Devolved Rivercare Grants Rehab - 1488 tonnes / year SAVE 53 t/y

Total Phosphorus export: Current - 344 tonnes / year,

MRCCC Devolved Rivercare Grants Rehab - 328 tonnes / year SAVE 16 t/y

Estimating Nutrient Reduction

CSIRO Land & Water SEDNET Model for the Mary River Catchment predicts that:

- Total Nitrogen export to the river mouth is currently - 1541 tonnes/yr;
- Total Phosphorus export to the river mouth is currently - 344 tonnes/yr

The model has estimated as a result of 3 years of "Implementing the Mary River & Tributaries Rehabilitation Plan" NHT Project has resulted in:

- Total Nitrogen export has been reduced by 19.5 tonnes/yr
- Total Phosphorus export has been reduced by 5.9 tonnes/yr

Therefore from the data presented above it is obvious that continuation of this Rivercare Devolved Grant program will significantly assist with the implementation of improved water quality.

1.5) Project Linkages to Strategies & Plans

MARY RIVER CATCHMENT STRATEGY - 8.6 Riverbank Stabilisation (RBS) Strategies

Objectives:

- To increase funding for planned and coordinated riparian zone research and riverbank restoration work.
- To raise community awareness of causative factors and possible solutions.

Strategy RBS1: Develop broad scale awareness of riparian areas in the catchment, and seek community participation in developing solutions to prevent further degradation.

Strategy RBS2: Reduce negative impacts of grazing and other activities on riverbanks with landholders' participation.

Strategy RBS5: Provide support for those attempting to address riverbank erosion.

MARY RIVER & TRIBUTARIES REHABILITATION PLAN - Goals for Achievement by 2010

Goal 1 – **CONSERVATION OF FLAGSHIP SPECIES**

Sustainability Indicators to measure achievement of goal

- Ample shade exists from streambank vegetation in target reaches
- Abundant fish cover exists from natural and introduced snags in target reaches

Goal 3 – **PROTECTION OF REACHES OF CONSERVATION SIGNIFICANCE**

Sustainability Indicators to measure achievement of goal

- All public conservation reaches will be managed and enhance riverine ecosystems and their scientific, recreational and intrinsic values.
- Most landholders who manage similar good quality remnants will be involved in voluntary protection measures through the provision of financial and other incentives that recognise the public value of their efforts.

Goal 4 – **HEALTHIER WATERWAYS**

Sustainability Indicators to measure achievement of goal

- The diversity and abundance of stream bugs indicating good stream health will be increased in most reaches.
- Water quality will be improved in most reaches.

Goal 5 – **RIPARIAN LANDHOLDER CAPACITY TO TACKLE DEGRADED REACHES**

Sustainability Indicators to measure achievement of goal

- All riparian landholders will understand why it is important to manage and protect streambanks.
- Supply sufficient resources to ensure community empowerment, extension, facilitation, education and incentive programs.
- Riparian fencing will be erected on areas most at risk from grazing pressure.
- Strategic revegetation initiatives will have occurred in high visibility locations and adjacent to remnant sections of good riparian vegetation.

Goal 8 – **AN EMPOWERED, COMMITTED AND CARING COMMUNITY**

Sustainability Indicators to measure achievement of goal

- Community – government partnerships are driving education, extension, rehabilitation and conservation actions.

1.6) The Study Area:

The Mary River has its origins in the mountains of the Conondale Ranges near the township of Maleny, high in the Sunshine Coast hinterland of sub-tropical South-east Queensland (see Figure 1.1). Downstream some 307 kilometres the Mary River discharges at River Heads into the Great Sandy Straits between the mainland and the World Heritage listed Fraser Island. The Mary River Catchment has 2947km of waterways, many of which contain communities of remnant riparian vegetation of conservation significance (Stockwell, 1999). These riparian communities provide habitat for a diverse range of flora and fauna some of which has been identified as rare, vulnerable and endangered under the Nature Conservation Wildlife Act (1996). The estuarine riparian communities in the lower Mary are of international significance for wader birds, added to the Ramsar list in 1999 (Stockwell, 1999).

Of the 9400 square kilometres of the catchment, 67% has been subjected to moderate land clearing, 28% of this has been extensively cleared primarily for beef and dairy cattle grazing (Kelly et al 1997). This clearing of the fertile alluvial floodplains has significantly reduced native riparian vegetation cover and contributed to the alteration of the natural dynamics of river processes in the Mary River Catchment (Kelly et al 1997). The State of the Rivers Report for the Mary Catchment rated riparian vegetation as very poor for 40% of the stream length and poor for a further 23% (Johnson, 1997). This report also identified that riparian communities in the catchment had poor riparian width and contained a high percentage of exotic species. The average riparian width was 17m across the catchment but the main Mary River sub catchment riparian width averaged only 0.5m with 85% of the stream length being eroded and 13% being considered unstable (Stockwell, 1999).

Regional ecosystems (REs), defined as an integrated entity derived from landscape pattern, geology and landform, and vegetation, provide a robust classification for biodiversity planning that incorporates ecological processes at the landscape scale (Sattler & Williams, 1999). Field observations noted that the majority of riparian sites were riparian rainforest or RE 12.3.1, with mostly Blue gum (*Eucalyptus tereticornis*) and Flooded gum (*E. grandis*), classified as RE 12.3.11, occurring above the riparian zone. The RE 12.3.1 is listed as an endangered ecosystem, while 12.3.11 listed as Of Concern. A description of each is given in Table 1.1.

Regional ecosystem 12.3.1

Description: Complex to simple notophyll rainforest on Cainozoic alluvial plains.
Waterhousea floribunda is predominant fringing stream channels:
Other species may include *Cryptocarya hypospodia, C. obovata, C. triplinervis, Argyrodendron trifoliolatum, Ficus coronata, F. fraseri, F. macrophylla, Aphananthe philippinensis, Elaeocarpus grandis, Grevillea robusta, Castanospermum australe* and *Syzygium francisii. Ficus racemosa* and *Nauclea orientalis* in north of bioregion. Eucalyptus emergents (e.g. *E. grandis*) and *Araucaria cunninghamii*; less commonly
Agathis robusta may also be Habitat for rare and threatened flora and fauna species including

Special Comments:
Xanthostemon oppositifolius, Fontainea rostrata, Macadamia integrifolia, M. ternifolia, Ornithoptera richmondia and Cyclopsitla diophthalma coxeni.
Important for fruit-eating birds, many of which migrate seasonally from upland to lowland rainforest.
Extensively cleared for agriculture. Prone to invasion by weeds such as camphor laurel *Cinnamomum camphora*, cat's claw creeper *Macfadyena unguiscati* on margins and when disturbed. Often too narrow to be mapped at 1:100 000 scale. Occurs up to about 100 km inland. The types recognised by Sparshott et al. (1997) indicate that geographical patterns are evident within the

Estimated extent:
In September 2000, 10-30% of the pre-clearing extent remained of an ecosystem with a restricted remnant extent

Vegetation management status: (June 2001) Endangered

Regional ecosystem 12.3.11

Description:
Tall woodland to tall open forest of *Eucalyptus siderophloia, Corymbia intermedia, E. tereticornis +/- Angophora leiocarpa, E. exserta, E. grandis, Lophostemon suaveolens, C. trachyphloia, C. tessellaris, C. citriodora, E. umbra, E. tindaliae, E. racemosa, Melaleuca quinquenervia and M. viridiflora* on Cainozoic alluvial plains and drainage lines along coastal lowlands south of Bundaberg. Patches of *Melaleuca sieberii* may occur. *E. seeana* may also be present south of Landsborough.

Special Comments: Extensively cleared and modified in populous southern parts of the bioregion.

Estimated extent: In September 2000, 10-30% of the pre-clearing extent remained

Vegetation management status: (June 2001) Of concern

(Young and Dillewaard, 2002)

Table 1.1

1.7) WHY MONITOR

Monitoring and evaluation strategies are essential components of any riparian or river rehabilitation project. Evaluation is the best way to improve our knowledge about what works, what doesn't and how we can best direct our rehabilitation efforts. Monitoring strategies are key components of the overall evaluation process that allows you and others to learn from the project and discover whether rehabilitation aims have been met (LWRRDC, 2000).


Mary River – Scotchy Pocket, Tiaro Shire

The monitoring of these Rivercare sites from December 2002 to February 2003 complies with the Level 3: Bronze Medal monitoring evaluation level, defined as unreplicated, uncontrolled, sampling before and after rehabilitation (Rutherford, Jerie & Marsh, 1999). This monitoring has been established to gather baseline data on the condition of various sites. The procedure is to be repeated in future years so as to gauge any changes that have occurred. Although there is no control site to make comparisons against, the sample sites are replicated.

"The Index of Stream Condition has been developed as a tool to assist management of waterways in Victoria and will be used to:

- aid objective setting by catchment managers;
- benchmark the condition of streams; and
- assess the long-term effectiveness of management intervention in rehabilitating streams."

(Ladson & White, 1999)

2) METHODOLOGY

2.1) Materials

- Letter of introduction to landholder from MRCCC
- Data sheets
  - Index of Stream Condition (ISC)
  - Corridors of Green (COG)
  - Waterwatch
  - Participant Survey
- Clipboard and pens
- Camera
- Hand held Global Position System
- Tape measure
- Water monitoring equipment
  - pH, electrical conductivity, temperature monitoring equipment
  - Turbidity tube
  - Container for nutrient water sample
  - Permanent marker pen
  - Aluminium foil
  - Esky
  - Waders
- Plant identification books
- Specimen bags and secatuers for plant identification and seed collection
- Index of Stream Condition Field Manual
- Star pickets and spray paint
- Hammer, not too big
- First aid kit, snake bite kit
- Wide brimmed hat, long trousers, long sleeved shirt, sturdy boots
- Drinking water and insect repellent
- Four Wheel Drive vehicle

2.2) SOCIAL/ATTITUDINAL LANDHOLDER SURVEY:

An attitudinal survey was completed before the monitoring work began on site. It acted as both an ice-breaker and helped to gain information needed to accurately complete the monitoring, such as bed stability, de-snagging and the appropriate positions for the transects.

The survey contained a total of ten questions ranging from the landholders major riparian issues to their level of satisfaction with the Rivercare Grant. All landholders were happy to answer the questions, and often further comments were given, which were also noted down. Any landholders who were not able to help us complete the survey on the monitoring day were sent a copy of the form, and asked to post the completed copy back to MRCCC. An example of the survey response sheet can be found in appendix 1.

2.3) Biophysical Monitoring & Evaluation Procedures

2.3.1) On-Site

With assistance from the landholder a monitoring site was determined. The monitoring site was central along the Rivercare project area, with 200 meters of riparian land upstream and downstream of the central transect (see figure 2.1).

Streamside Zone – This was taken to be the distance from the toe to the top of the bank. Change of land-use, where clearly defined by a fence line would define the top of the Streamside Zone and the bar was included if vegetated. Refer to the ISC Field Manual for examples.

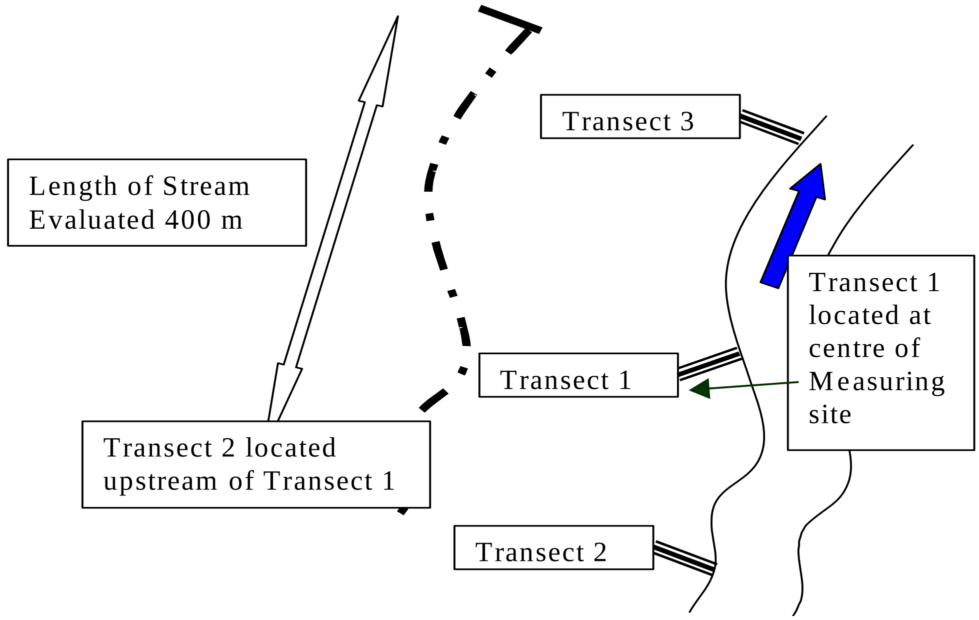

Figure 2.1

Photographic Recording

A total of at least eight photographs were taken at each site. In order to differentiate between sites, and transects within a site, the following system was established.

Photograph Number	Transect	Position
1	1	From the star picket at the toe of the bank looking upstream
2	1	From the same star picket, but looking downstream
3	1	From the same picket, looking along the transect up the bank
4	1	From the top of the bank looking back down the transect
5	2	From the bottom of the bank looking up the transect
6	2	From the top of the bank looking down the transect
7	3	From the bottom of the bank looking up the transect
8	3	From the top of the bank looking down the transect

Upon deciding on the location of Transect 1, a star picket was hammered into place at the toe of the bank, and another at the top of the Streamside Zone (see definition in figure 2.1) to ensure that future monitoring activities are carried out in the same location.

2.3.2 Corridors of Green (COG) Assessment Techniques

The Corridors of Green (COG) assessment was undertaken along only Transect 1. The COG data sheet was completed using the following steps:

1) Tape measure is laid out between the star pickets to provide a straight line to base the quadrats on.
2) GPS location at the toe of the bank is recorded. Three, five metre by three metre quadrants are located along the transect on the downstream side (see figure 2.2).
3) Quadrant 1 was located at the toe of the bank, the second in the middle and the third at the top of the streamside zone.
4) Plants that affect the quadrant through shading or protection from wind are to be included as part of the quadrant. If all the plants surrounding the quadrant were removed a very different result would be recorded. A specimen of any plant species not known is to be taken for identification by a botanist, recording the date, location, and name of the collector on a bag containing the specimen. Recording species A, B, etc., on the data sheet and on the bag ensures accurate data collection.

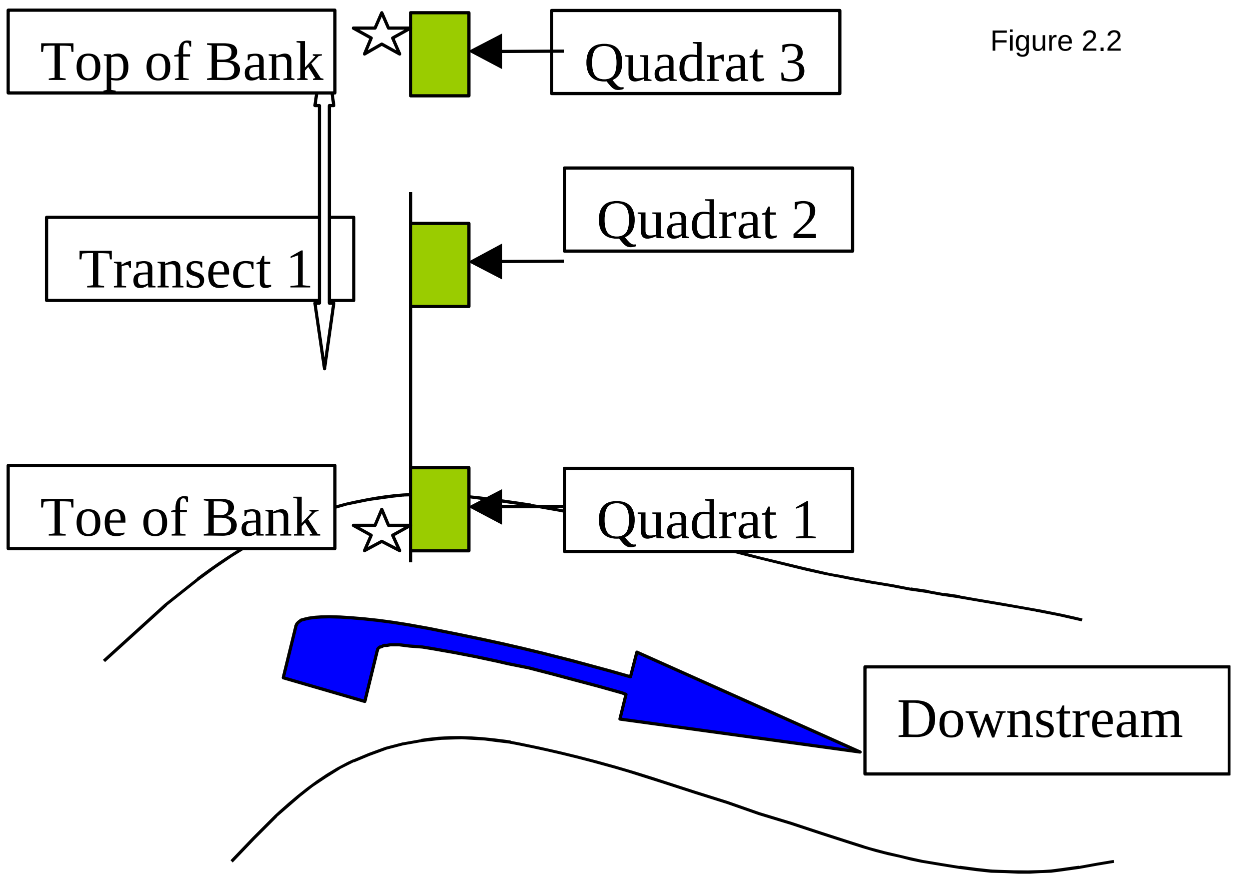

Figure 2.2

The Corridors of Green Condition and Diversity Scores were obtained by allocating a score from zero to five from nine components of the COG data collection sheet, four relating to condition and five relating to plant species diversity. The parameters are shown in table 2.1. A total score out of 45 was formulated by the addition of the condition and diversity scores.

Condition Parameters	**Score**
Foliage Protective Cover: Braun Blanquet Cover Abundance: 5 = >75%, 4 = 50–75%, 3 = 25-50%, 2 = <25%, 1 = 0-5%.	Score was directly derived from the COG data collection sheet (i.e. 1 = 1, 2 = 2, 3 =3, 4 = 4, 5 = 5)
Litter Cover (LC) minus Bare Earth (BE) (Braun Blanquet Cover Abundance: 5 = >75%, 4 = 50–75%, 3 = 25-50%, 2 = <25%, 1 = 0-5%.)	Score was derived as above for both LC and BE. BE score was then subtracted from LC, to give an accurate representation of litter cover condition. (Any negative scores were converted to a score of zero, therefore all scores where out of a total possible 5).
Weed Cover (Braun Blanquet Cover Abundance: 5 = >75%, 4 = 50–75%, 3 = 25-50%, 2 = <25%, 1 = 0-5%.)	Score was obtained by inverting the weed cover value from the COG data sheet. (I.e. 1 = 5, 2 = 4, 3 = 3, 4 = 2. 5 = 1).
Number of Recruits	Score was derived from the COG data collection sheet, where: 0 recruits = score of 0, 1-5 = 1, 6-10 = 2, 11-15 = 3, 16-20 = 4, > 20 = 5.
Diversity Parameters	
Tree Species Diversity	Score was determined by the number tree species >2m recorded on the COG data collection sheet. More than 5 species was given a score of 5.
Shrub Species Diversity	Score was determined by the number trees species <2m recorded on the COG data collection sheet. More than 5 species was given a score of 5.
Ground Cover Species Diversity	Score was determined by the number of ground cover species recorded in the comments column on the COG data collection sheet. Any scores greater than 5 are given a value of 5.
Weeds of Concern Diversity	Score was determined by the inverting the number of weeds of concern species recorded in the comments column on the COG data collection sheet (i.e. 1 = 5, 2 = 4, 3 = 3, 4 = 2. 5 = 1). Any scores greater than 5 are given a value of 5.
Recruits Species Diversity	The number of recruit species recorded on the COG data collection sheet determined score. Any scores greater than 5 are given a value of 5.

Table 2.1

2.3.3) Index of Stream Condition (ISC) Assessment Techniques

The Index of Stream Condition (ISC) was used to calculate a score reflecting condition of a particular stream reach. The data can be used as a comparison when evaluating the projects in the future. As this is a Victorian model it is expected to have limitations in its application outside of Victoria. However scores that were calculated by the ISC in the Mary River catchment were considered to reflect conditions in the field, that is, stream reaches in good condition scored highly. This indicates that little change would be needed to modify the scoring for South East Queensland.

A full ISC score contains five elements each of ten points, Hydrology, Physical Form, Streamside Zone, Water Quality and Aquatic Life. Two of these elements were not within the scope of this report; Hydrology due to the lack of data available in Queensland, where it is readily accessible for Victorian stream reaches and Aquatic Life which would have been too time consuming considering the number of sites to be monitored and would have required further technical assistance. This meant that a score out of thirty was derived from the assessment, rather than fifty, and was converted to percentage for comparison purposes.

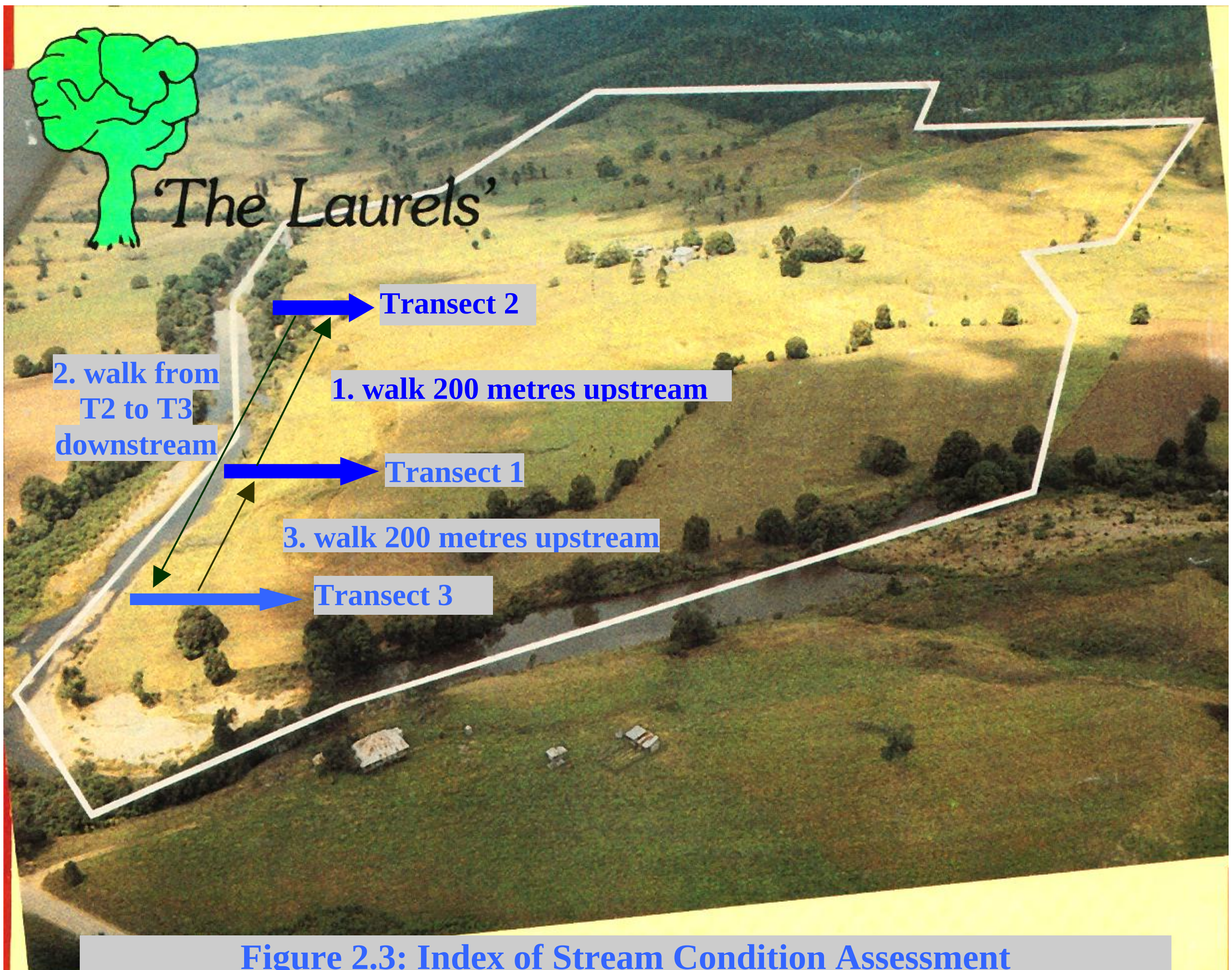

Figure 2.3: Index of Stream Condition Assessment Assesing the Streamside Zone & Physical Form

2.3.3.A) Methodology for Assessing Streamside Zone and Physical Form - Sub Index 1 and 2

After completing the preliminary data on the front page of the data, the following steps were followed:

Step 1: Pace out distance between Transect 1 and 2, remembering to head upstream, and inspect stream for physical habitat and bed stability (physical form) – see Figure 2.3.
Assess Transect 2; record GPS as start of measuring site.

Step 2: Evaluate Longitudinal Continuity while pacing from Transect 2 to 3.
Assess Transect 3; record GPS as end of measuring site – see Figure 2.3.

Step 3: Inspect stream for physical habitat and bed stability while returning to Transect 1- See Figure 2.3.

Table 2.2 displays the parameters measured for both the Streamside Zone and Physical Form sub-indexes.

Streamside Zone	**Physical Form**
Bank Stability	Bed Stability
Width of Streamside Zone	Instream Physical Habitat
Structural Intactness	Miscellaneous Questions
Cover of Exotic Vegetation	Longitudinal Continuity
Regeneration of Indigenous Woody Vegetation	Other Observations
Livestock Access	

Table 2.2

2.3.3.B) How to Assess Water Quality (ISC Sub Index 3)

It is recommended that water monitoring activities be carried out at Transect 1 using the guidelines established by MRCCC, to maintain consistency. Measurements were made on-site of water temperature, pH and electrical conductivity using a Model HI 98130 HANNA Probe and turbidity was assessed using a clarity tube.

A water sample was also taken for nitrate and phosphate testing. The sample was wrapped in aluminium foil and placed immediately in a cooled esky to ensure microbial activity is reduced, which could affect the nutrient readings. All water samples were placed in a freezer as soon as posible. Testing was undertaken at MRCCC, within two weeks of having been collected using a Palintest 5000 Colorimeter.

Water Quality Parameters
Water Temperature (“C)
pH
Conductivity (mS/cm)
Turbidity (NTUs)
Phosphate
Nitrate

3) FINDINGS:

3.1 Catchment Level

CATCHMENT	ISC (Out of 30)
GOULBURN CATCHMENT	20.3
MARY CATCHMENT	17.9
BROKEN CATCHMENT	17.9
HOPKINS CATCHMENT	16.1

Table 3.1

The ISC components of Hydrology and Aquatic Life were not within the scope of this project, however comparisons with other catchments may still be made using the Physical form, streamside zone and water quality components. ISC monitoring has been undertaken on all of the major Victorian catchments (results can be viewed at www.vicwaterdata.net). Of these the Hopkins, Goulburn and Broken catchments have been chosen for comparison, due to their similarities to the Mary catchment. Table 3.1 supplies an average of the total ISC scores from each stream reach of the four catchments (out of a possible 30). It can be seen that the sites monitored within the Mary catchment rated an equal second.

The following Figure 3.1 breaks these average scores into their three components, and shows that the sites monitored within the Mary catchment score the highest for both physical form and streamside zone, however scores the lowest for the water quality component.

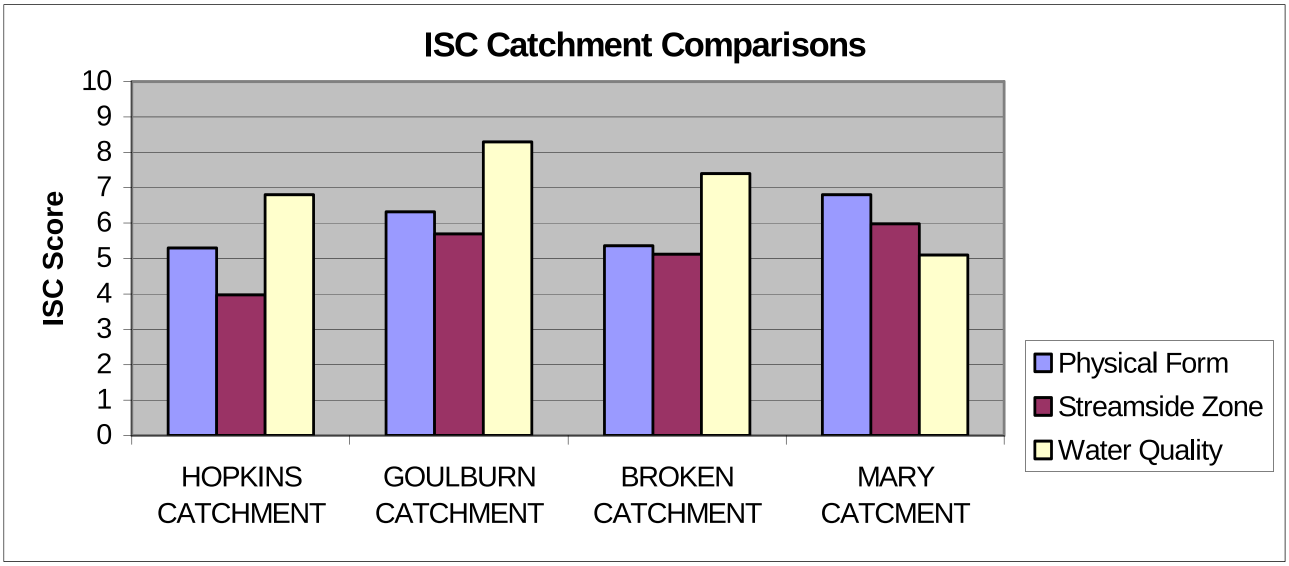

Figure 3.1

A limitation of these comparisons, is that the sites monitored within the Mary Catchment were classified as "high priority" and "high conservation" sites on freehold land (as defined by the Mary River and Tributaries Rehabilitation Plan, 2001). This may somewhat skew these comparisons as the Victorian ISC results were obtained from evenly spaced, strategic positions, in order to gauge a reprehensive figure for the entire catchment (Ladson & White, 1999).

3.1.1) Lower And Upper Catchment Comparisons

Figure 3.2 presents the mean scores of sites located in the upper Mary River catchment zones and the scores of sites located in the lower Mary River catchment zones. The upper Mary River catchment is defined as the Mary River catchment zone located above the township of Gympie and the lower catchment as below Gympie. There appears to be little difference between the upper and lower catchment for both ISC and Cog scores. It then follows that for the stream reaches monitored for this project, the level of degradation or condition of the sites was very similar in the upper and lower catchments.

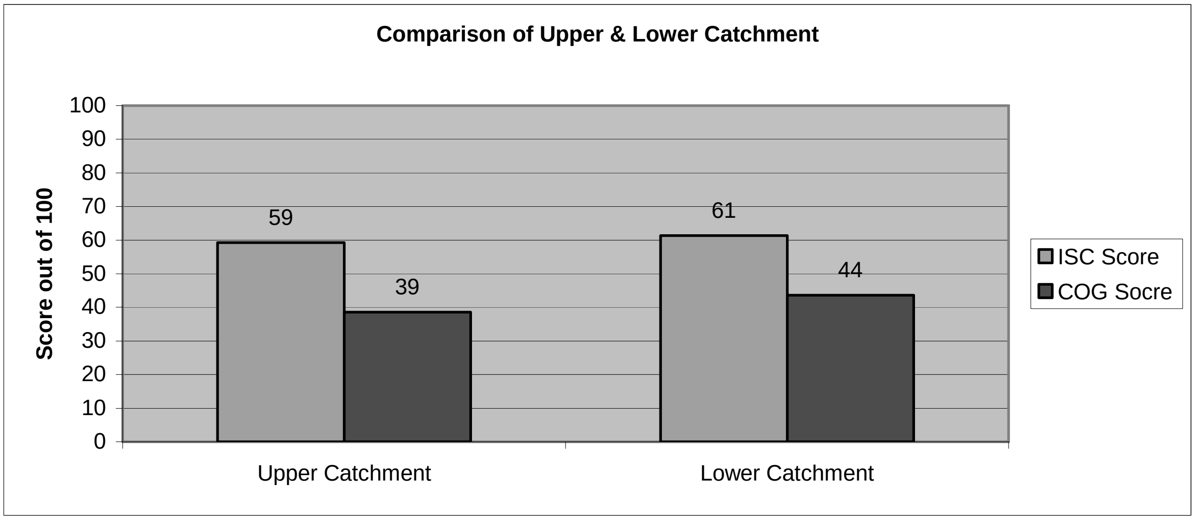

Figure 3.2

3.1.2) Priority Reaches According to Mary River and Tributaries Rehabilitation Plan.

The intention of the Rivercare Grants Scheme was to aid landholders whose property was adjoining streams that had been identified as being of *high priority*, according to the Mary River and Tributatries rehabilitation Plan (MRTRP) (pers. comm. B. Wedlock, 2003)). The MRTRP was undertaken to prioritise stream reaches according to their recovery potential. Stream reaches with high ecosystem recovery potential or that contained rare or threatened species were classified as “high priority”.

Of the sites monitored, 94% were located within a reach of significant strategic or conservation value, thus achieving the desired outcome of addressing problems in the catchment through identifying priority areas. Environmental issues at each site were addressed by the project activities, and it is considered by this report that the majority of issues at each priority reach were addressed.

Table 3.2 displays the priority reach that each of the sites occurred in, the problems faced for each of the priority reaches and the mitigation methods used.

Priority Reach	**Environmental Issues**	**Management Actions**	**Implemen -tation**	**Monitored Sites**
Priority 1: Reaches of Regional Conservation Significance.	1. Elevated nutrient levels. 2. Water quality issues 3. Bank instability 4. Un-managed cattle access 5. Environmental weed problems 6. Clearing of riparian zone			None – all these reaches are contained within State Forest or National Park
Priority 2: Unprotected reaches of regional conservation significance.	1. Elevated nutrient levels. 2. Water quality issues 3. Bank instability 4. Un-managed cattle access 5. Environmental weed problems 6. Clearing of riparian zone	1. Fencing of riparian zone 2. Off stream watering points 3. Tree planting 4. Weed removal	1. Yes 2. Yes 3. Yes 4. Yes (when time and funds permit)	Upper Cedar Creek - CED26 Upper Gerhaghtys Creek -GER1 Mid Belli Creek - BEL0 Kilcoy Creek - KIL11 Balgowlah Creek - BAL11
Priority 3: Reaches of local conservation value	1. Elevated nutrient levels. 2. Water quality issues 3. Bank instability 4. Un-managed cattle access 5. Environmental weed problems	1. Fencing of riparian zone 2. Off stream watering points 3. Tree planting 4. Weed removal	1. Yes 2. Yes 3. Yes 4. Yes	Upper Mary River - MAR24
Priority 4: Deteriorating strategic reaches.	1. Elevated nutrient levels. 2. Water quality issues 3. Bank instability 4. Un-managed cattle access 5. Environmental weed problems	1. Fencing of riparian zone 2. Off stream watering points 3. Tree planting 4. Weed removal	1. Yes 2. Yes 3. Yes 4. Yes	Upper Obi Obi Creek - OBI19 Upper Obi Obi Creek - OBI25 Zachariah Creek - ZAC17 Upper Six Mile Creek - SIX10-HF Upper Six Mile Creek - SIX10-BF Pinbarren Creek - PIN28 Slaty Creek - SLA31

Priority 5: Linking reaches and significant remnant sections.	1. Elevated nutrient levels. 2. Water quality issues 3. Bank instability 4. Un-managed cattle access 5. Environmental weed problems	1. Fencing of riparian zone 2. Off stream watering points 3. Tree planting 4. Weed removal	1. Yes 2. Yes 3. Yes 4. Yes	Lower Six Mile Creek - SIX20-SS Lower Six Mile Creek - SIX20-RA Mid Mary River - MAR21 Wonga Creek - WON6 Lower Widgee Creek - WID8 Lower Mary River - MAR9
Priority 6: Reaches with moderate recovery potential.				
Priority 7: Reaches with little chance of natural recovery.	1. Bed and bank stability 2. Channel widening 3. Un-managed cattle access 4. Water quality 5. Depletion of aquatic habitat	1. Fencing of riparian zone 2. Off stream watering points 3. Tree planting 4. Weed removal	1. Yes 2. Yes 3. Yes	Mid Mary River - MAR4

Table 3.2

Fencing streams to exclude stock and installation of off stream watering points are two methods by which these issues have been tackled. Tree planting was used on some sites that did not have stock accessing the stream.

These methods directly address the environmental issues occurring within a reach. By fencing the cattle off from the stream

- nutrient levels are lowered as less manure is delivered directly into the stream, as well as reducing sediment being stirred up by stock in the waterway;
- banks are not being disturbed by cattle moving up and down to drink as water is now available from troughs on easily accessible ground.

Where tree planting has taken place, the effects will take considerably more time to become evident. The intended results are:

- greater stabilisation of banks due to vegetation reducing flow velocities, intercepting surface runoff and the root structures directly reinforcing riverbanks, (Abernethy & Rutherford, 1999).
- shading of water ways reducing and stabilising water temperatures, specifically providing suitable habitat requirements for the Mary River Cod (Simpson & Jackson, 1996).

Most landholders were carrying out weed control activities, although this was not directly associated with the Rivercare Grant Scheme, except for some instances, where it is noted as in-kind support.

3.2) Rivercare Project Sites:

3.2.1) Biophysical Comparisons

The term "biophysical" involves any physical parameters that may in some way influence the biological characteristics of a riparian site. The biophysical parameters within this monitoring project were assessed using the ISC and COG data collection methods. The only non-biophysical data collected was the landholder survey.

INDEX OF STREAM CONDITON:

The total ISC score for each of the monitoring sites is shown in Figure 3.3. The three sections of each bar represent the three components of the ISC. The variety of resulting ISC scores, ranging from 14 to 23, indicate that the sites monitored were in various stages of degradation.

The object of ISC is to compare the physical parameters influencing riparian vegetation health, stream bank stability and instream health of monitored sites, either over time or between sites. As this is a baseline-monitoring project, comparisons over time are not available. Comparisons between sites are also not applicable due to differences in locations, and level of degradation. However on site observations while monitoring were inline with the ISC and COG scores. For example the SLA31 site ISC result of 23 out of 30, scored second highest which accurately reflected the high water quality, the wide and intact streamside zone and the stability of stream bed and banks for that location in the catchment.

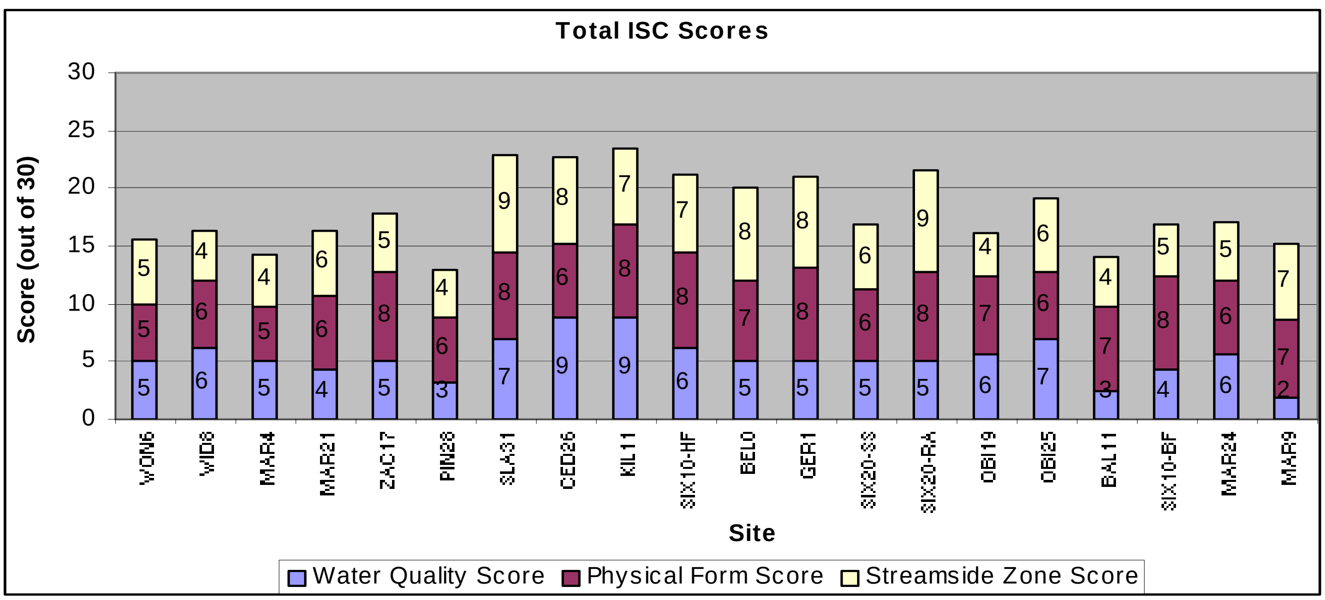

Figure 3.3

CORRIDORS OF GREEN:

As described within the methodology, the COG of data sheet information was converted into a score for both condition and diversity of the vegetation along transect 1. The scores in Figure 3.4 are a combination of these two parameters resulting in a possible score of 45. On its own, these scores are perhaps not such a good representation of the site, as they only represent the vegetation along transect one. However these scores and the associated data give a measure of plant diversity, which the ISC lacks and will prove extremely valuable as baseline data for future monitoring.

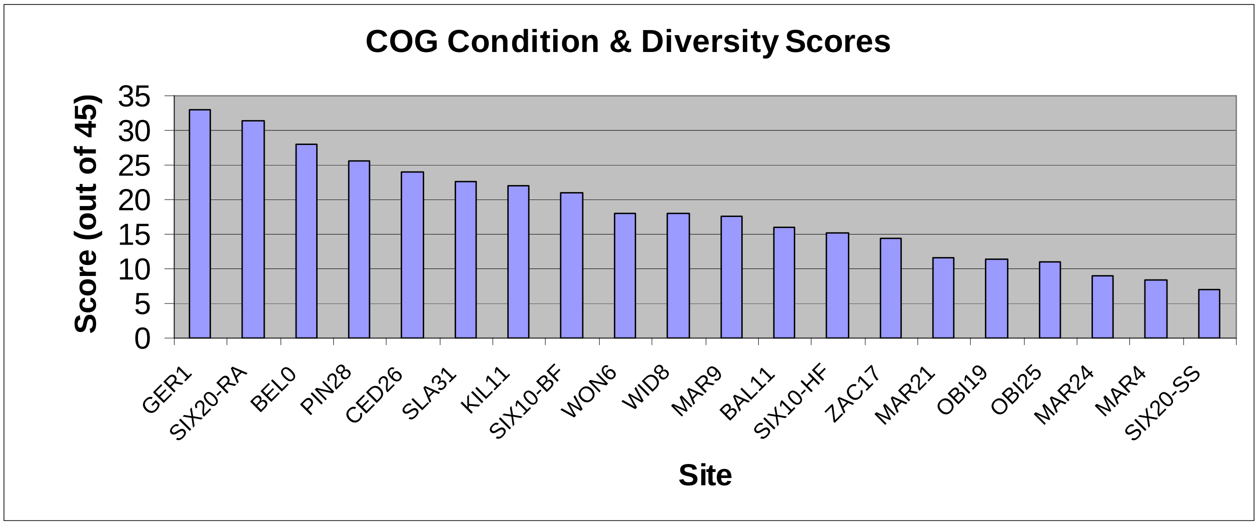

Figure 3.4

The ISC scores of the SIX20-SS site and SIX20-RA (see figure 3.3) may also be used as an example of effectiveness for the COG scores. The SIX20-SS site, which scored a 7 out of 45, represented a monoculture of pasture grass, while the SIX20-RA scored 31 out of 45 was predominately well-established natural regeneration, with a high level of species diversity.

COMBINED INDEX OF STREAM CONDITION AND CORRIDORS OF GREEN SCORES:

Table 3.3 displays the mean values ISC and COG scores (when converted to a mutual score out of 100). The standard deviation is also given to show the deviation around the means. The variance again indicates that the sites may be located in varying vegetation communities and are at different levels of degradation, and reinforces the statement that comparisons between sites should be made with caution.

	ISC Score	COG Score
Mean	60	41
SD	10	17

Table 3.3

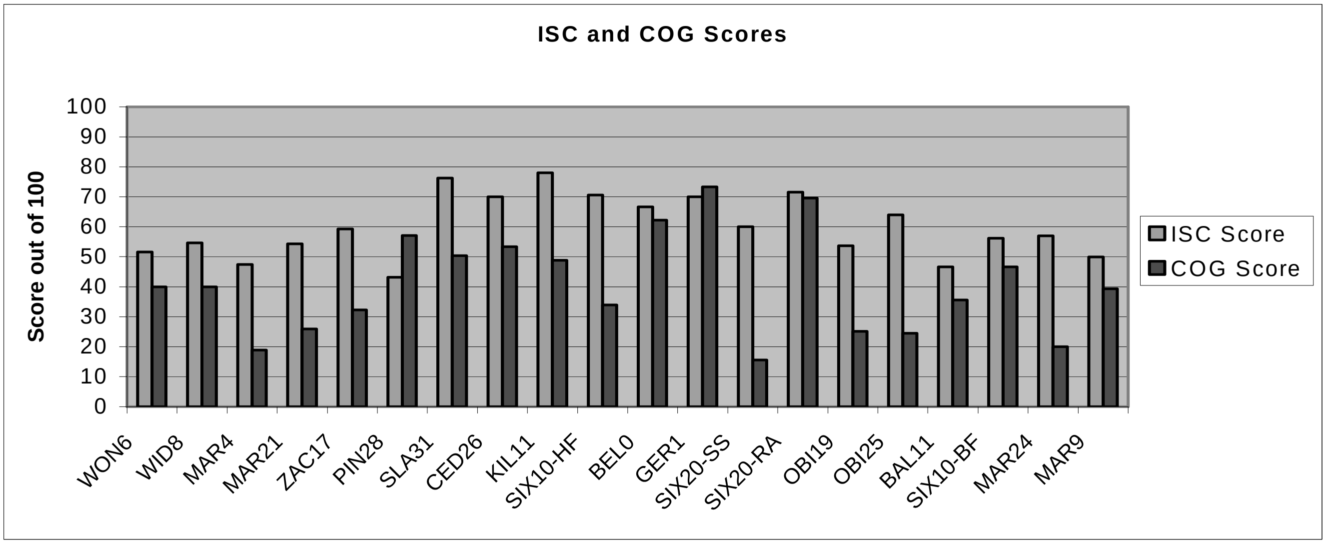

Figure 3.5

By converting the ISC and COG scores from scores to a percentage value a comparison can be made between these two scoring methods. Figure 3.5 represents this by presenting a bar chart with the converted ISC and COG scores for each site.

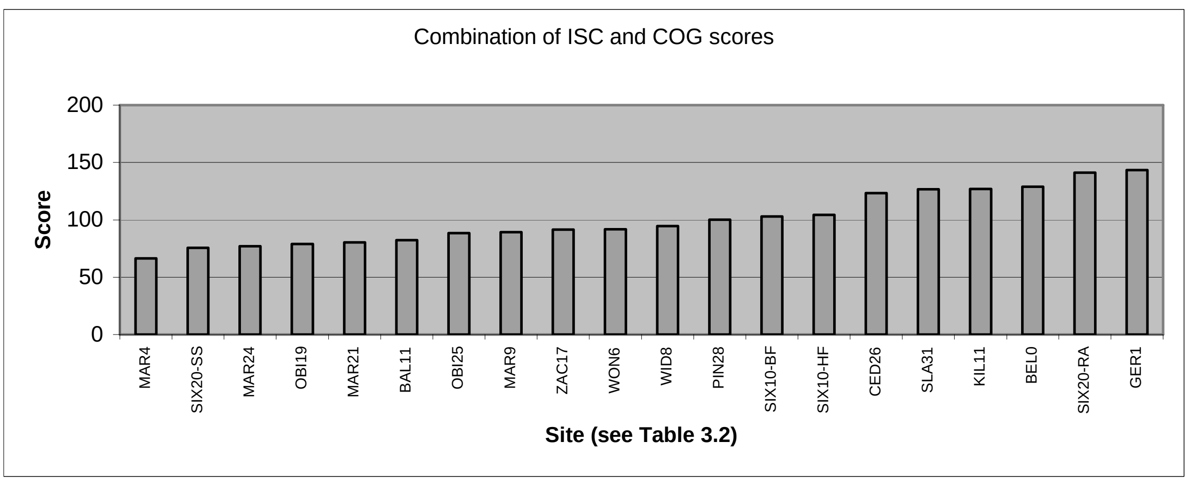

Figure 3.6

By combining the scores in figure 3.6 and obtaining a score out of 200, a comparison can be made between ISC and COG scores. A standard deviation value of 23.2 for these combined scores is most likely due to differences in vegetation types and/or level of degradation.

RIPARIAN WIDTH:

As part of the ISC monitoring the width of the streamside zone was recorded at the three transacts for each site. Although the ISC manual provided several methods for determining the streamside zone, the most applicable definition for the majority of our sites was to measure the area from the toe of the riparian zone to the change of land use. The majority of sites were fenced at or above the top bank, as part of the Rivercare Grant Scheme, providing a clear definition of the streamside zone. For those sites not fenced, or those where the fence was located well beyond the top bank, the top of the streamside zone was determined by the bank full level. This was not necessarily the upper extent of the riparian vegetation.

Stream Name	**Project**	**Width of Streamside Zone**	**ISC Out of 100**	**COG Out of 100**
Mary River	MAR4	>40m	47	19
Slaty Creek	SLA31	>40m	76	50
Cedar Creek	CED26	>40m	70	53
Geraghtys Creek	GER1	>40m	70	73
Mary River	MAR21	30-40m	54	26
Six Mile Creek	SIX20-SS	30-40m	60	16
Six Mile Creek	SIX20-RA	30-40m	72	70
Six Mile Creek	SIX10-BF	30-40m	56	47
Mary River	MAR24	30-40m	57	20
Wonga Creek	WON6	10-30m	52	40
Widgee Creek	WID8	10-30m	55	40
Pinbarren Creek	PIN28	10-30m	43	57
Kilcoy Creek	KIL11	10-30m	78	49
Six Mile Creek	SIX10-HF	10-30m	71	34
Belli Creek	BEL0	10-30m	67	62
Obi Obi Creek	OBI19	10-30m	54	25
Obi Obi Creek	OBI25	10-30m	64	24
Balgowlah Creek	BAL11	10-30m	47	36
Mary River	MAR9	10-30m	50	39
Zachariah Creek	ZAC17	5-10m	59	32
	Mode	10-30m		

Table 3.4

As Table 3.4 shows, there is a moderate degree of variance in the streamside zone widths. Three sites produced a width greater than 40 metres, and the most frequently occurring width being between 10 to 30 metres. Only one site revealed a width of 5 to 10 metres, indicating that the issue of inadequate streamside widths is not of much concern.

Karssies and Prosser (1999) state that for the South East Queensland region, a recommended riparian filter strip width ranges from 2 metres in areas with medium rainfall erosivity, medium soil erodibility and low slope and up to >30 metres where rainfall erosivity is high, soil erodibility is high and slope levels are high. It can be seen that the majority of our sites fall within these limits, and in fact 9 sites recording streamside zone widths greater than the recommended 30 metres. However the fact that streamside zone was, in most cases, measured to the change in land-use, and not to the upper extent of riparian vegetation, must be noted.

Table 3.4 also shows the ISC and COG scores for each corresponding site. It reveals no relationship between width of streamside zone and score.

BANK STABILITY

By using the ISC bank stability component (I), a snapshot of the condition of the banks of the monitored Rivercare sites can be assessed.

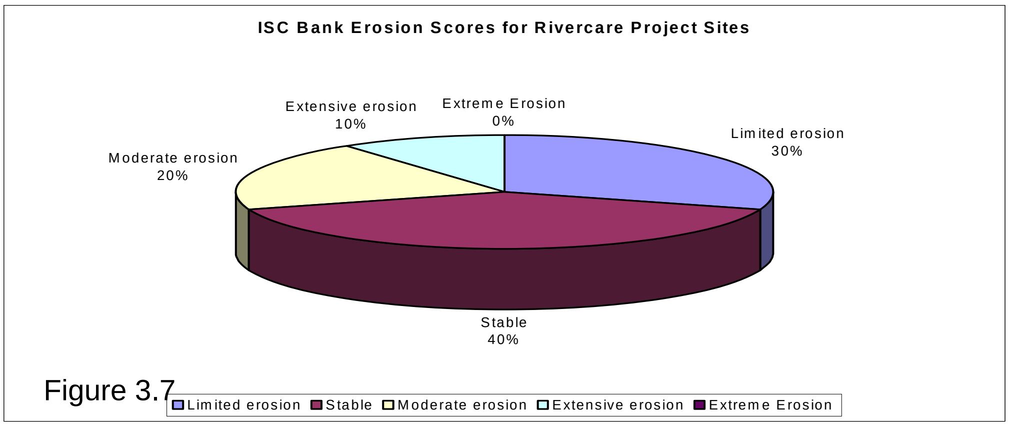

Figure 3.7

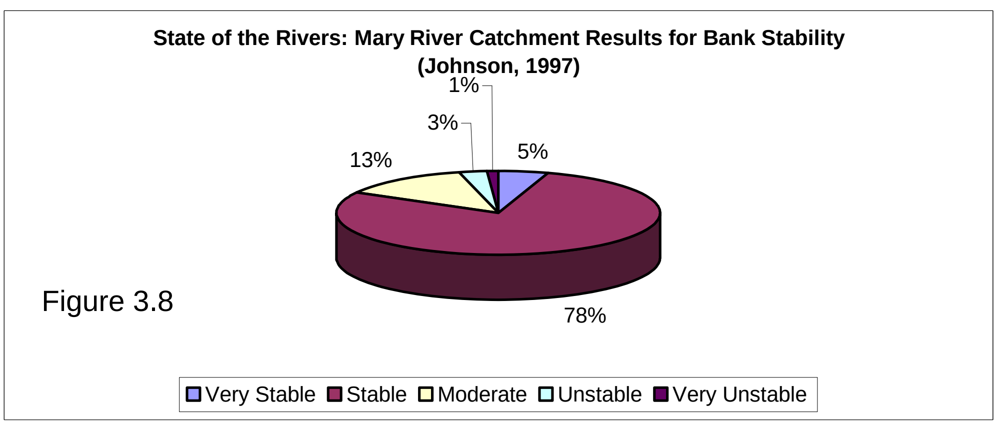

Figure 3.8

Figure 3.7 reveals that the overall bank stability of the sites is in fair condition, with 40% classed as stable and 30% recorded as having only limited erosion. None of the sites obtained a score of '0' (extreme erosion). When comparing these overall results to the Mary River and Major Tributaries: State of the Rivers Report (1997) findings (see figure 3.8) it can be seen that while both exhibit similar results for the three higher levels of erosion, the State of the Rivers shows a greater percent of banks classed as stable, while the ISC monitoring has a far greater occurrence of banks with limited erosion and stable banks.

Observation showed that the bank erosion occurring was predominately scour erosion (removal of individual sediment particles or aggregates by flow. Mass failure (slumping) was noted on occasion. This was expected particularly in the lowland areas where bank height increased (Abernethy & Rutherford, 1999).

UNDERSTOREY AND CANOPY COVER:

When measuring the structural intactness of the tree, shrub and ground layers, the ISC data sheet offers only the choices of:

1) Greater than 80% cover
2) From 20% to 80%
3) Less than 20%.

This scoring works well as part of an overall assessment of a site but is not suitable for assessing vegetation cover on its own.

The Corridors of Green data sheet provides a more in depth assessment of vegetation cover by using the Braun-Blanquet cover abundance scoring technique (5 = >75%, 4 = 50 – 70%, 3 = 25 – 50%, 2 = <25%, 1 = 0 – 5%, + = a few scattered individual). However COG fails to distinguish between the tree, shrub and ground layers, and only one COG sheet was filled out (on transect 1) for each site.

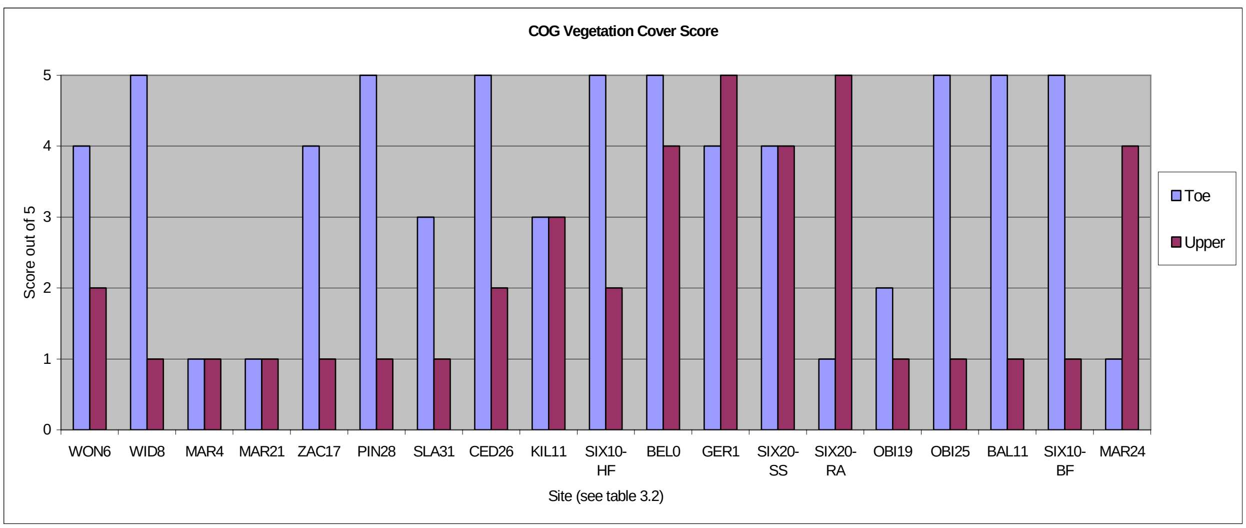

Figure 3.9

Figure 3.9 depicts the relationship between vegetation and bank position. It shows that for 12 sites the vegetation cover is higher at the toe of the bank, while only 3 sites exhibit a higher percent cover on the upper section of the bank. Four sites have equal cover at the toe and upper part of the bank. The definition of the top of the streamside zone used most often, that is to the change in land use, may explain the low percentages of vegetation cover on the upper bank sections. The upper transect was, in many cases, located within a strip of pasture grass which ran from the fence to the beginning of the riparian vegetation. The pasture strips averaged 7 meters wide.

Site	Litter Cover	Litter Depth (cm)	Soil Score (out of 10) Tongway & Hindley, 1995
WON6	25-50%	0.3	3
WID8	0-5%	0.7	1
MAR4	0-5%	0.0	1
MAR21	0-5%	0.0	1
ZAC17	<25%	0.7	2
PIN28	>75%	2.0	6
SLA31	25-50%	0.8	3
CED26	>75%	0.5	6
KIL11	50-75%	1.3	4
SIX10-HF	<25%	2.1	2
BEL0	50-75%	1.3	4
GER1	>75%	3.7	7
SIX20-SS	0-5%	0.0	1
SIX20-RA	>75%	2.5	7
OBI19	<25%	2.0	2
OBI25	0-5%	0.3	1
BAL11	25-50%	1.3	3
SIX10-BF	25-50%	1.2	3
MAR24	0-5%	0.3	1
MAR9	25-50%	0.5	3

Table 3.5

The average vegetation cover of the entire streamside zone for all sites was 25 – 50%. Similar monitoring of 50 MRCCC Rivercare project sites in 2001 revealed averages of 22.3 percent cover for total native vegetation cover and 26.66 percent cover for total vegetation cover, which included exotic species (Berrill, 2001).

It is apparent from Figure 3.9 that the vegetation cover scored well at the toe of the project sites banks. This may be viewed as a positive sign in terms of stream health as lack of shaded instream habitat is thought to be a major reason for the rarity or absence of the Mary River Cod in many areas (Simpson & Jackson, 1996). It may also be noted that while the over storey will have a large influence over the process of slumping erosion, shrubs and grasses are equally important for controlling scour erosion (Abernethy & Rutherford, 1999).

The average litter depth of for the sites monitored was 1.2cm, the deepest level being 5cm. Table 3.5 shows the scores derived by using Tongway and Hindley's Landscape Function and Analysis: Assessment of Soil Condition, leaf litter component. This scoring technique looks at the percent cover of plant litter within the transect as well as the litter depth, to reach a score out of 10. Litter depth is only looked at where litter cover is 100 percent and then only scored when the depth is greater than 20mm.

Overall the scores for the monitored sites are noticeably low, and as plant litter is strongly related soil condition (particularly the levels of carbon and nitrogen stored in soil layers, and nutrient cycling processes) it may be a point of some concern (Tongway & Hindley, 1995). Soil properties and condition are not investigated using the ISC and COG monitoring techniques, and may a limitation of the monitoring.

WEEDS:

As with the majority of riparian zones on rural land, weeds proved to be a significant problem at the monitored sites (Berrill 2000). From observation, once cattle access is managed, weed control is thought to be the top priority in the care of riparian zones. The top ten dicotyledon weeds for the sites monitored are listed in Table 3.6.

Pasture grasses within the riparian zones were also noted as weeds. However the average percentage of dicotyledon weeds and monocotyledon weeds for each transect were 49.6 and 48.5 respectively. These figures suggest that the dicotyledon weeds, such as lantana and mistflower, and the monocot pasture grass weeds maybe of equal concern, when regarding them in terms of the amount of area they have invaded on a riparian site.

TOP TEN WEED LIST:
Lantana
Mistflower
Cats Claw Creeper
Wild Tobacco
Camphor Laurel
Privet (broad and narrow leaf)
Desmodium
Wandering Jew
Coaral Berry
Sida Rotusa

Table 3.6

The ISC is quite thorough when assessing the cover of tree, shrub and ground layer weeds. Table 3.7 shows both the total and the average of the scores for each weed layer, at each of the three transects at each site (where scores are inverse so that: 4 = 0%, 3 = 1-10%, 2 = 11-40%, 1 = 40-60%, 0 = >60%)

	Tree Layer	**Shrub Layer**	**Ground Layer**
Average of Scores	**2.8**	**0.8**	**0.4**

Table 3.7

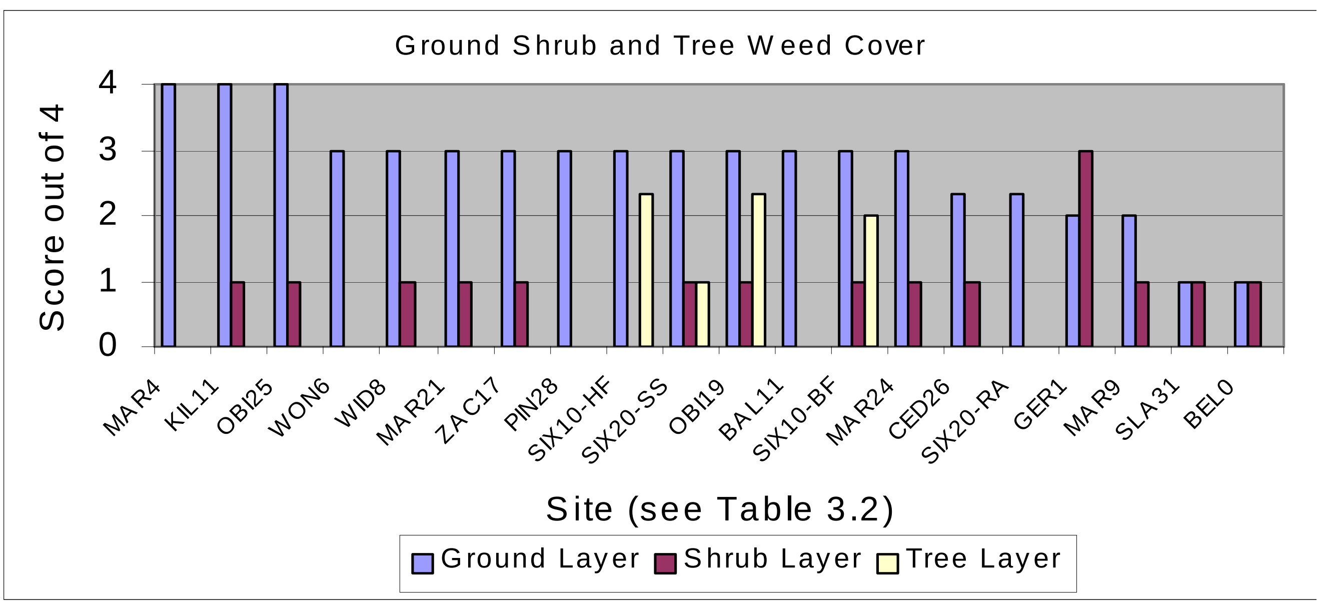

Figure 3.10

By viewing Table 3.7 and figure 3.10, it can be seen that the ground layer of weeds is identified as the most significant problem in terms of weed coverage of the riparian zone, while the tree layer is of least concern. As cattle have been removed from a significant number of sites, this may have a combined affect on the cover of ground weeds. Firstly certain weed species will no longer be suppressed by cattle grazing, and secondly the disturbed environment created by past cattle access often produces an ideal environment for weed invasion.

REGENERATION VERSUS REVEGETATION

Of the sites monitored nine were classed as predominately revegetation sites, where planting of native vegetation had been undertaken for approximately half of the area of the site. Eleven were classed as natural regeneration sites, where no planting had been undertaken, and natural regeneration was being relied upon for ecosystem improvements.

A comparison between the vegetation management techniques of active revegetation and natural regeneration was attained, as seen in Figure 3.11. Using both the ISC and COG scores it can be seen that total scores are a little higher for the regeneration sites. A possible explanation for this may lie in the fact that the sites left to regenerate were the ones with no cause for revegetation as they were in the best condition, therefore reflecting the slightly better scores.

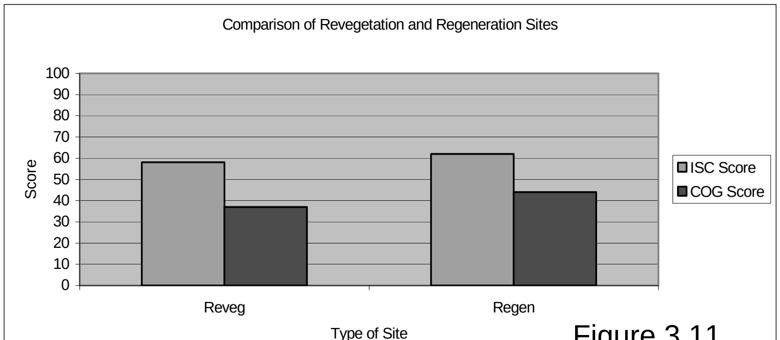

Figure 3.11

STOCK ACCESS

The question of whether stock have access to the stream is asked in section VI of the ISC. Of the 60 transects monitored 34 showed signs of cattle access, while 26 exhibited no evidence of cattle access. Cattle, either dairy or beef, were the only livestock accessing the sites, apart from one case of deer grazing, and one site where horse grazing was occuring.

At many sites where cattle were excluded, it was observed that cattle were still gaining access. Several explanations are offered:

- Cases were noted of riparian fences being neglected, damaged and not repaired.
- Incidents were recorded of neighbouring cattle entering the riparian zone, this was due either to neglected fencing or the extremely low water levels caused by the drought, which allowed neighbouring cattle to easily cross the streams.
- Some landholders also grazed their cattle on within the riparian zone, for short in frequent periods, as a weed, and grass control method.
- Cattle also accessed fenced areas at sites for short and infrequent grazing periods. This use of the fenced zone as an emergency fodder resource may have been particularly prevalent due to the recent times of drought.

Table 3.8 depicts the monitored parameters that were most likely to be affected by cattle access on the riparian zone. The most significant result is the much lower number of native plant recruits (that is naturally occurring native plants germinating from deposited seed) occurring in the cattle accessed sites. The obvious cause is the cattle grazing on or trampling the native recruits in the riparian zone. This may lead to loss of biodiversity, increased potential for weed invasion, increased soil erosion and loss of habitat and wildlife values (Land and Water Australia, 2002).

Biophysical Parameters affected by Livestock Access							
Livestock Access	**Bank Stability**	**Structural Intactness**	**Turbidity (NTU)**	**Phosphate mg/l**	**Nitrate**	**COG Score (out of 45)**	**No of Native Recruits**
NO	3.6 / 5	3.0 / 5	7.0	0.073	0.029	22.3	18.3
YES	2.8 / 5	2.7 / 5	10.4	0.076	0.040	15.0	2.9

Table 3.8

These results provide further evidence of the highly significant improvement of self-propagating native flora species regeneration capacities and abilities in areas where grazing has been excluded. There is, however, also evidence of livestock exclusion resulting in reduced cover of exotic species, therefore while fencing is an important first step, active management may be required to enhance recovery (Spooner, Lunt & Robinson 2002).

The remaining parameters in Table 3.8 show that the scores for bank stability, structural intactness, and the COG scores are all slightly higher for the ungrazed average, while the water quality parameters of turbidity, phosphate, nitrate levels are all marginally higher for the grazed sites average.

INSTREAM PHYSICAL HABITAT

Instream physical habitat was measured by visual observation of the density, location (proximity to stream edges) and origin (indigenous or exotic) of large woody debris in the stream over the 400 meter reach. Figure 3.12 displays the resulting scores for each site, as well as stating whether or not each reach has been de-snagged.

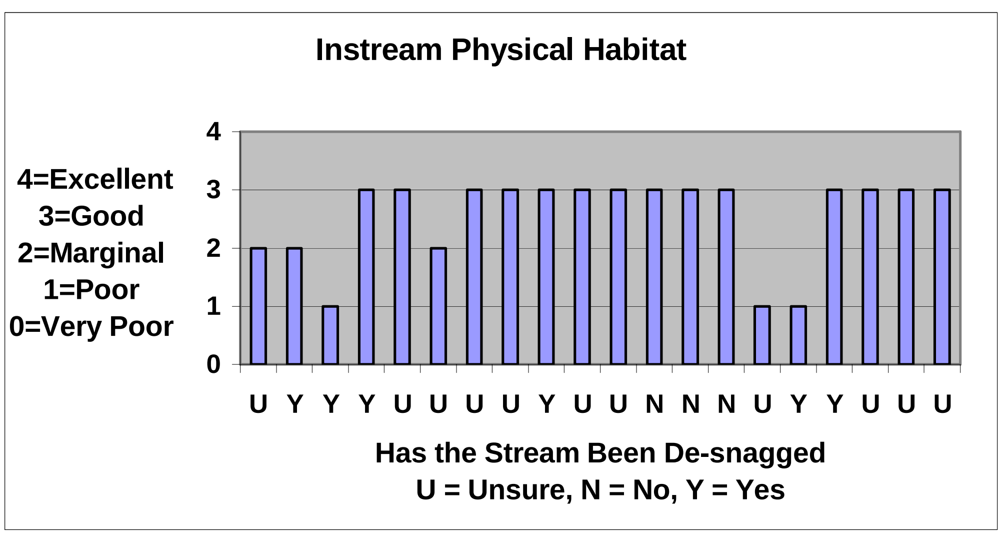

Figure 3.12

The results show that the majority of sites had "good" instream physical habitat. Radio tracking research on the Mary River Cod has revealed that 93 percent of all cod observations occurred within 2m of submerged timber (Simpson & Jackson 1996), suggesting that suitable woody debris habitat for cod is available at most of the sites monitored.

		Tempera ture (*C)	**Ph**	**Conductiv-ity mS/cm**	**Turbidity NTU**	**Phosphate mg/l**	**Nitrate**
Stream	**ANZECC Guidelines**	**< 2% increase**	**6.5 - 9.0**	**< 1.5**	**< 10% change**	**0.01 – 0.1**	**0.1 – 0.75**
Wonga Creek	WON6	26.3	8.12	1.330	<7	0.06	0.076
Widgee Creek	WID8	25.35	7.55	3.945	0	0.03	0.009
Mary River	MAR4	27.2	7.79	0.335	0	0.1	0.015
Mary River	MAR21	28.65	8.14	0.300	0	0.07	0.021
Zachariah Creek	ZAC17	23.55	5.96	3.365	0	0.07	0.024
Pinbarren Creek	PIN28	22.75	5.65	0.255	12	0.07	0.000
Slaty Creek	SLA31	25.9	7.06	4.105	<7	0.02	0.110
Kilcoy Creek	KIL11	23.1	7.38	0.190	<7	0.00	0.009
Six Mile Creek	SIX10-HF	23.35	6.58	0.170	<7	0.04	0.063
Belli Creek	BEL0	21.65	6.81	0.320	17.5	0.22	0.047
Geraghtys Creek	GER1	23.55	7.57	0.670	<7	0.20	0.009
Six Mile Creek	SIX20-RA	23.45	6.44	0.457	16.5		
Obi Obi Creek	OBI19	24.15	7.39	0.120	10	0.03	0.043
Obi Obi Creek	OBI25	25.15	7.36	0.100	<7	0.05	0.032
Balagowa-lah Creek	BAL11	24.95	6.68	0.595	20	0.07	0.063
Six Mile Creek	SIX10-BF	23.45	6.68	0.120	15	0.04	0.024
Mary River	MAR24	24.9	7.43	0.340	<7	0.10	0.003
Mary River	MAR9	28.6	8.17	0.785	20	0.10	0.055
	Average	24.778	7.15	0.972	10.091	0.07	0.035

Table 3.9

AFFECT OF DROUGHT:

The data discussed in this report was collected towards the end of one of South East Queensland more severe droughts. The drought may have had influenced the water quality data collected, for example, with a lack of fresh water inputs into stream system lowering the turbidity data when compared to normal flow situations (Berrill, 2002). This was evident during Mary Catchment Crawl held during Water Week October 2002 which sampled 14 sites on the main Mary River during the height of the 2002 drought.

The drought also affected property management activities, such as the use of the riparian zone as emergency fodder for livestock, as well as creating opportunity for neighbouring livestock to access some sites. The drought may have also had minor impacts on the health of riparian vegetation.

WATER QUALITY

Table 3.9 above, compares the ANZECC water quality guidelines for Healthy Aquatic Ecosystems with the data from the monitored Rivercare Grant sites.

Temperature and turbidity can not be compared as no further data has been collected to observe any changes. However it can be seen that only 2 sites fall outside of the ANZECC guidelines for pH, 3 sites recorded higher than acceptable conductivity scores, while two sites were higher than acceptable for Phosphate levels. All Nitrate levels were well bellow the set upper limit.

3.2.2) Landholder Attitudes

The sites monitored were all located on rural properties, however the land use of the properties varied. The three land uses were: Beef Cattle production, Dairy and Rural Residential. Figure 3.13 shows the percentage represented by each land use.

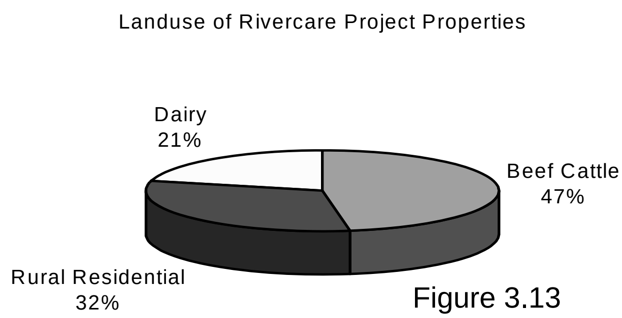

Figure 3.13

A survey of each landholder was conducted regarding, various topics relating to the Rivercare Grant Scheme. Question four queried the landholders on what they believed to be the major riparian zone issues on their property. Each issue option had a priority rating and a mean for the total points scored for each issue was derived. Figure 3.14 displays the mean score for each issue given in percentage form.

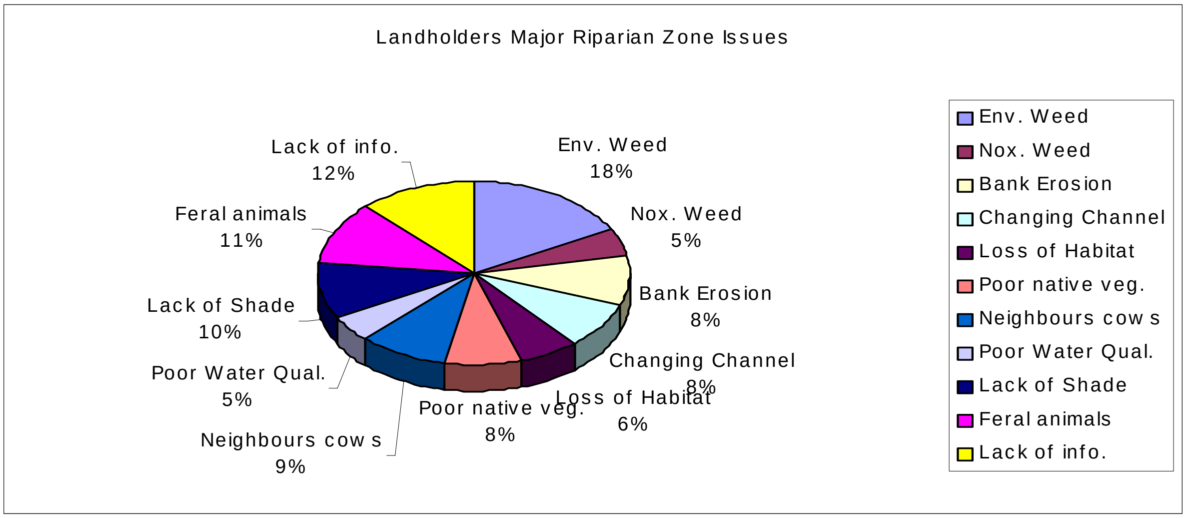

Figure 3.14

This information shows that the three issues given highest priority by landholders were;

- Environmental weeds
- Lack of information
- Feral animals

The high priority rating for the lack of information issue by the landholders were usually followed by a comment on the lack of communication between departments involved in rehabilitating the Mary River.

Dingoes were also commented upon when the issue of feral animals was raised, as dingoes are considered by many to be an Australian native animal, perhaps some form of education may be required. The issue of wild dogs, and the difficulty in discerning the difference between them and dingoes was also mentioned.

One landholder stated that he had no problems with dingoes, and that he actually found dingoes to be beneficial to his farm management practices because of the role they played in cleaning up his cattle graveyard.

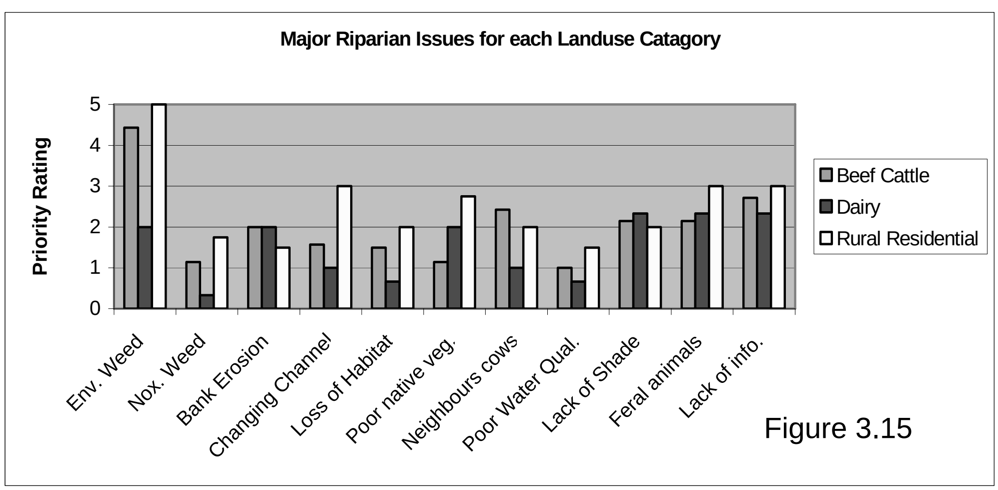

Figure 3.15

Poor water quality was rated as the least significant issue of concern for landholders. This is interesting as it may reflect a lack of knowledge in regards to the importance of water quality issues for both property management and catchment health.

Figure 3.15 uses the same information gathered by the survey (represented in Figure 3.14) but looks at the priority of concerns for each of the three separate land uses. This was performed to investigate any differences in priority riparian issues between the three groups. The figure shows that the Dairy farmers surveyed were least concerned with the issues of environmental weeds and loss of native habitat, but were however, most concerned regarding the issue of lack of shade. Figure 3.15 also suggests that the Rural Residential landholders felt the most strongly about the ecological health of their streams.

Analysis of the survey results revealed that the landholders had no major problems with the paper work and monetary reimbursements involved with the Rivercare grants scheme. However it should be noted that Whitten, et al (2002), in a report evaluating devolved grant schemes for fresh water ecosystems states that when governments impose their own internal administrative standards and bureaucratic structures onto the managers of devolved grant schemes, that this may erode the cost effectiveness of the schemes. The majority of landholders commented that they would have most likely have undertaken the work without the grants, however would have taken much longer to do so and would not have been able to achieve as much.

Table 3.10 demonstrates the positive attitudes of landholders towards the Rivercare Grant Scheme work in relation to their overall property management.

Landholders Priority Rating of the Rivercare Grant Work in Relation to Overall Property Management			
Very High Priority	High Priority	Medium Priority	Low Priority
60%	20%	13%	0%

Table 3.10

The general consensus of the landholders was that they are interested in achieving further Rivercare goals, however they would appreciate both further financial and on-ground support, particularly in the area of weed control.

<u>3.3) Assessment Of Methodology:</u>

3.3.1 Comparison Of Methods

The biophysical monitoring of the Rivercare riparian zones has involved the use of both the Index of Stream Condition (ISC) and the Corridors of Green (COG) vegetation data sheet. Although these two methods ultimately assess different biophysical data, they do overlap, and both have their strengths and weaknesses.

To assess revegetation sites Greening Australia (Tiaro) developed the Corridors of Green vegetation data sheet. For the purposes of this report a scoring system was developed, which was not provided on the COG assessment. This was necessary to quantify the data collected on the COG.

The advantage of the COG assessment is that it contains information relating to species diversity. In its raw form assessment of this data is difficult, and a score will assist with comparison over time. To assist with the generation of the score, the addition of columns for ground covers and vines, would eliminate the need to write these into the comments area, as was done on the current version of the COG data sheet. Further the COG weed cover assessment did not differentiate between ground cover and tree cover, where as the ISC assessment did.

Despite the overlap between the ISC and COG assessment in regard to foliage cover, they both measure different attributes of stream health. The COG is a useful method of gathering information on the species diversity of a site, a characteristic that the ISC does not assess. The ISC assesses the length of a stream and at water quality. Therefore both systems compliment each other, and justifies the use of both methods of data collection.

Site PIN28 was the only site to score higher on the COG (57 out of 100) than on the ISC (43 out of 100). This was due to the stream being quite discontinuous with low water quality, and yet the vegetation that was monitored for COG on transect 1, was of a high diversity.

All other sites had a lower COG score than ISC which was most likely due to a reasonable cover of streamside vegetation and reasonable water quality, as recorded on the ISC, but a lack of palnt species diversity in the quadrats assessed by the COG.

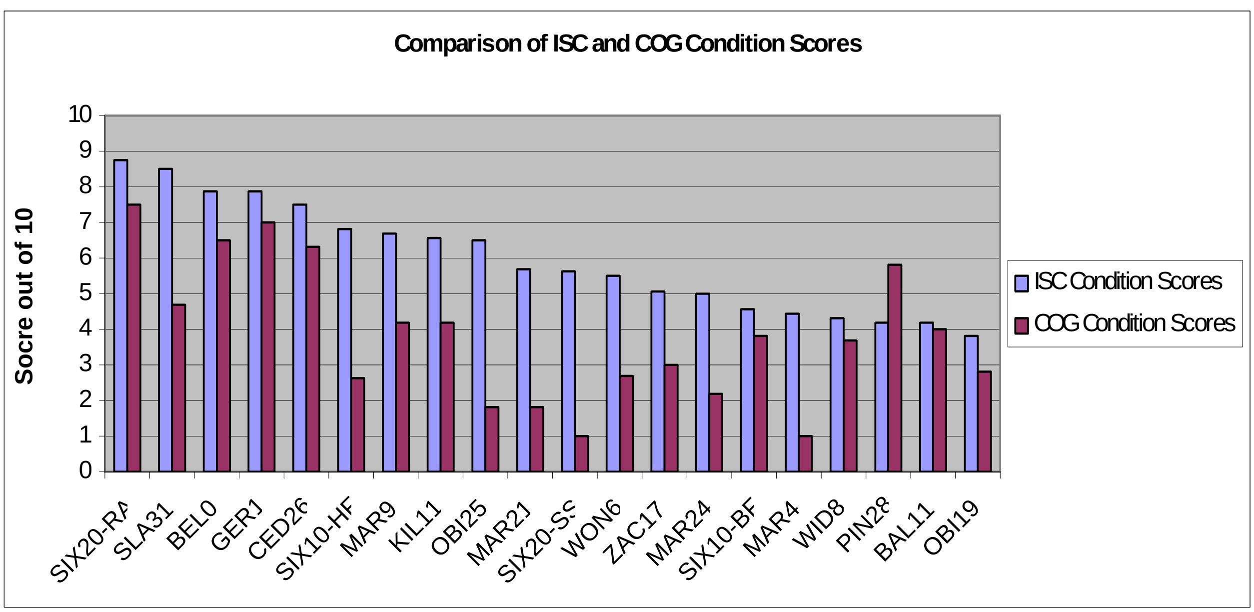

Figure 3.16

When developing the methodology for obtaining quantifiable scores from the COG data sheets, both a vegetation condition score and a vegetation diversity score (as described above) was used. Figure 3.16 displays a comparison between the condition scores derived from the COG and ISC data (the stream side zone score was used to derive the condition score for the ICS.)

Although the COG scoring system rates each site with a lower score, it can be seen that the condition scores for the ISC and COG are comparable for the majority of the sites.

3.3.2) Limitations Of Methods:

The primary limitation of this monitoring work is the lack of the Hydrology and Aquatic Life components of the ISC. It was not within the scope of this monitoring report to include these components due to time and funding restrictions, as well as lack of available data. However as the results have shown an accurate and relevant "snapshot" of the stream condition has been gained through the methodology used.

Within itself some limitation of the ISC may be pointed out. Firstly the ISC fails to look at any parameters which may measure the rate of bank retreat. A score for bank stability is recorded, however if say, moderate erosion was recorded in the baseline survey and was again recorded in the future monitoring, it will be noted that erosion is still occurring, but will not be able to assess at what rate it is occurring. The rate of bank retreat can be an essential factor in determining the urgency of any rehabilitation works (Abernethy & Rutherford, 1999).

Another important indicator of stream health that is not given attention in either the ISC or COG is the abundance and diversity of macrophytes (aquatic vegetation). Although some monitors may include macrophytes in the vegetation assessment of the ISC or on the COG data sheet, in most cases they would be ignored. The presence of highly invasive waterweeds, such as Water Hyacinth or Cabomba, can be extremely damaging to stream health, and are neglected in this monitoring procedure (Prosser, 2002).

The need for a control site is another limitation of this monitoring project. As described by Rutherford, Jerie & Marsh (1999) the Silver and Gold level monitoring programs are dependent on the methodology including the monitoring of a control site. Although a control site would increase the validity of the monitoring work, it would prove to be difficult to implement. The current monitoring sites are all located in different vegetation communities and at different levels of degradation, indicates that perhaps a separate control site would be required for each Rivercare site.

This monitoring project is based on the fact that baseline data is being collected, however this is not quite accurate. Although the monitoring has occurred quite recently after the mitigation work of fencing or revegetation had been undertaken, no data was recorded prior to the work, and so true baseline data (that is before any treatments have been applied) has not been recorded.

Finally, the ISC is designed to be measured repeatedly, so is simpler than a one-off detailed assessment of condition. The ISC provides information on long-term changes in stream condition and is only detailed enough to "flag" problems to be further investigated, rather than to define them completely (Brizga & Finlayson, 2000). Further Whitten, et al (2002), when assessing devolved grant schemes for fresh water ecosystems, state that ongoing monitoring (and hence costs) are required to assess the benefits of the changed ecosystem management. With these points in mind it is important to remember that this monitoring must be repeated in future years, in order to have any significant relevance.

4) HIGHLIGHTS:

4.1) Biophysical:

- The sites monitored in the Mary Catchment compared favourably with similar catchments in Victoria using the Index of Stream Condition, water quality being the only component to score lower.
- Priority actions outlined within the Mary River & Tributaries Rehabilitation Plan, were addressed in most cases. Weed control was the only priority action thought to be inadequately addressed.
- The average streamside zone width class was 10 to 30 meters, with the average width being 26 meters.
- Bank stability among the sites monitored was found to be of fair condition, with 40 percent of sites recording a "stable" score.
- The average vegetation cover of the streamside zone for all sites monitored was found to be between 25-50%. The vegetation cover scores for the toe of the bank were significantly higher than for the upper section of the streamside zone.
- The three major weed species occurring at the sites were; Lantana, Mistflower, Cats Claw Creeper and Wild tobacco. The ground layer weeds were identified as the most significant problem in terms of weed coverage of the riparian zone, while the tree layer weeds were of the least concern.
- Results showed evidence of significantly higher recruitment levels of naturally regenerating native plant species at sites where grazing had been excluded.
- Due to the drought some landholders have used the fenced off riparian zone as a source of emergency fodder. Also neighbouring livestock are accessing some Rivercare sites due to low stream levels.
- The water quality results were mostly within the ANZECC Water Quality Guidelines.

4.2) Landholder Attitudes:

- Of the sites monitored the 48% were located on beef grazing properties, 32% on rural residential and 21% on dairy.
- Environmental weeds, lack of information, and feral animals were rated as the top three issues of concern by the landholders.
- The general consensus of surveyed landholders was that they are interested in achieving further Rivercare goals, however they would appreciate both further financial and on-ground support, particularly in the area of weed control.

4.3) Methodology Assessment:

- Although the ISC and COG assessments overlapped on vegetation analysis, it was found that the COG data significantly complemented the ISC in terms of vegetation diversity information, an important factor in riparian assessment.
- The major limiting factor of the ISC assessment was the project's inability to include the Hydrology and Aquatic Life components, due to lack of information within Queensland and time restrictions.
- The COG assessment was limited in that only one data sheet was completed at each site, and the inability to quantifiably asses the data (hence the formulation of a scoring methodology).
- A control site, where no Rivercare work has been implemented, as well as a means of monitoring macrophyte (aquatic plants) particularly water weeds, was a further consideration.
- The methodology was found to be adequate for taking a "snapshot" of stream and riparian condition, and will "flag" any significant hydrologic or ecological problems.
- Future repetition of the monitoring will make the data far more meaningful through comparisons over time.

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