

Annual Nutrient Survey for Local Government Authorities

Results 2009



An initiative of the South East Regional Centre for Urban Landcare's
Phosphorus Awareness Project

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Supported by:



Caring for the Swan Canning Riverpark

Annual Nutrient Survey for Local Government Authorities

The Swan and Canning River systems, and many wetlands, are suffering from regular, sometimes toxic, algal blooms. These blooms occur due to excessive inputs of nutrients, phosphorus and nitrogen, combined with low water flows. The Phosphorus Awareness Project, supported by the Swan River Trust and managed by the South East Regional Centre for Urban Landcare, aims to raise awareness of the sources of nutrients, the responsibility to minimise their use, and how this can be achieved.

Local authorities are responsible for nutrient use on turfed areas, reserves and in local planning decisions and thus have the opportunity to lead the community by setting examples in best practice. The survey was designed to determine Local Government Authority (LGA) practice with respect to nutrient use, and to inform the local community.



The Swan-Canning Catchment consists of thirty Local Government Authorities (LGA's). This was the eighth survey of all LGA's in the Catchment (previously the nine LGA's of the Canning Catchment had been surveyed). Twenty three of the thirty LGA's responded to the survey. The LGA's that responded in 2009 were: Armadale, Bassendean, Bayswater, Belmont, Cambridge, Canning, Claremont, Cockburn, Cottesloe, East Fremantle, Fremantle, Joondalup, Kalamunda, Melville, Mundaring, Nedlands, Perth, Peppermint Grove, Serpentine-Jarrahdale, South Perth, Subiaco, Swan and Vincent. Twenty one of the twenty three LGA's that responded had participated in the 2008 survey.

The results of the survey indicated that LGA's in the Swan-Canning Catchment are conducting varying degrees of Best Management Practices (BMP's) in nutrient management. Overall the majority of LGA's conducted a high level of BMP's in the areas of nutrient monitoring and turf type. A medium level of BMP's was achieved in the areas of fertiliser applications, nutrient management, nutrient education, water quality monitoring, development control and waste water systems. Compared to the 2008 survey overall there has been an increase in the use of BMP's especially in the areas of nutrient management and nutrient education.

It is strongly recommended that every LGA reads the recommendations section at the end of this report. This recommendations section outlines the strategies that need to be implemented to achieve a high level of nutrient best management practice for all questions asked in this survey. The LGA's are encouraged to compare their individual responses to each question and implement recommendations that they currently do not undertake.

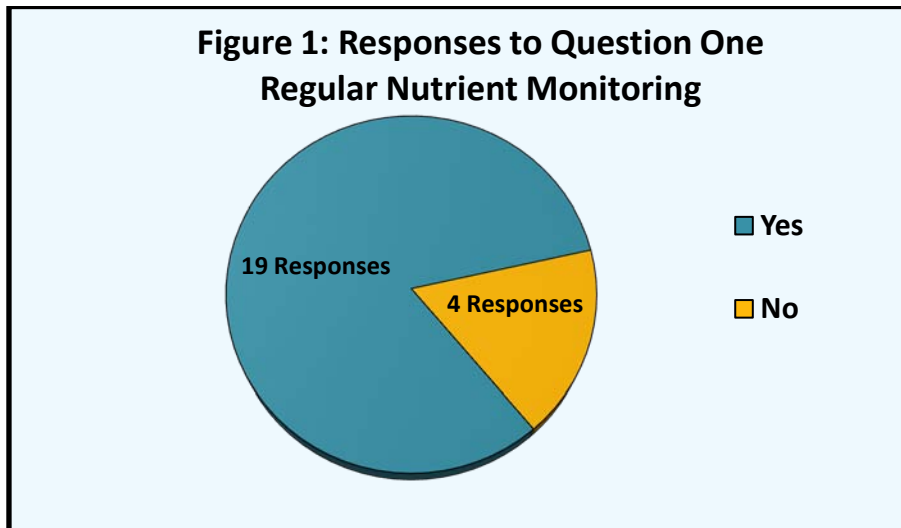
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Nutrient Monitoring

Figure 1 shows the responses from Question One.



Questions One and Two

Questions One and Two related to soil tests, leaf tissue analysis and moisture testing of nutrients in grassed and turfed areas. Figure 1 shows that nineteen out of the twenty three LGA's carried out at least one type of soil, leaf tissue and/or moisture testing in grassed and turfed areas. Compared to the 2008 survey, slightly less LGA's are conducting soil and/or leaf tissue analyses.

It is very encouraging that the majority of LGA's conducted nutrient testing. This testing is extremely important as it provides information to determine whether fertiliser is required and if required, the application rate and type of fertiliser needed. It is strongly recommended that all LGA's regularly conduct these tests before applying fertiliser, so that unnecessary fertiliser applications can be avoided. The leaf tissue nitrogen content should be maintained between 1.5% - 2% for passive turf and 2% - 3% for sports fields while the leaf tissue phosphorus content should be maintained between 0.2% - 0.4% (Ruscoe, Johnston & McKenzie, 2004).

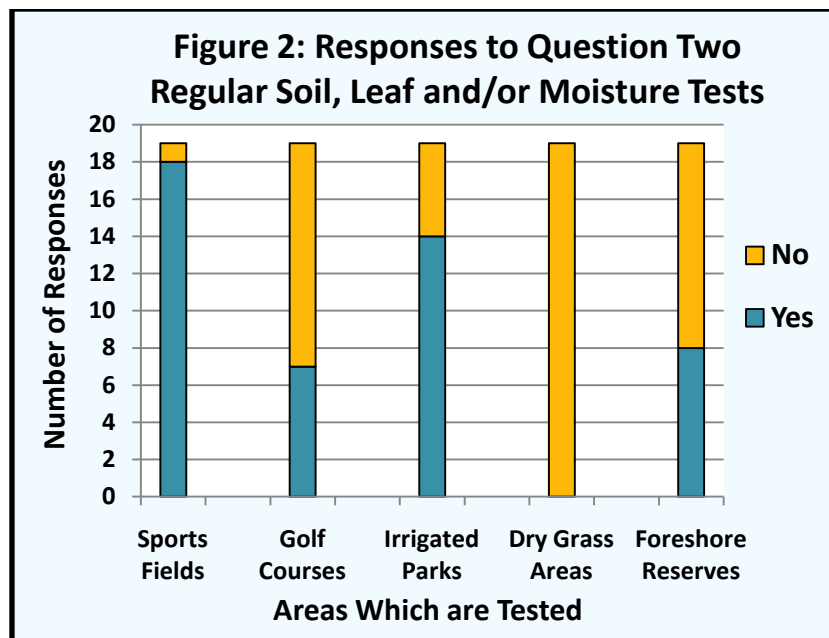


Figure 2 shows, of the nineteen LGA's that conducted soil, leaf tissue and/or moisture testing, eighteen tested their sports fields, seven tested golf courses, fourteen tested irrigated parks, none tested dry grass areas and eight tested foreshore reserves. Of the nineteen LGA's that tested these areas, eighteen conducted soil tests, fourteen conducted leaf tissue analysis and eleven conducted moisture testing.

Compared to the 2008 survey, the number of LGA's testing sports fields decreased slightly, testing of golf courses increased moderately, the number of LGA's testing irrigated parks increased moderately, testing of dry grass areas remained the same and the number of LGA's testing foreshore reserves increased slightly.

These results are encouraging especially the high number of LGA's testing sports fields. It is recommended that all LGA's test sports fields for soil, leaf tissue and moisture as they are high use areas requiring good quality turf where overfertilising and overwatering could occur if not monitored appropriately.

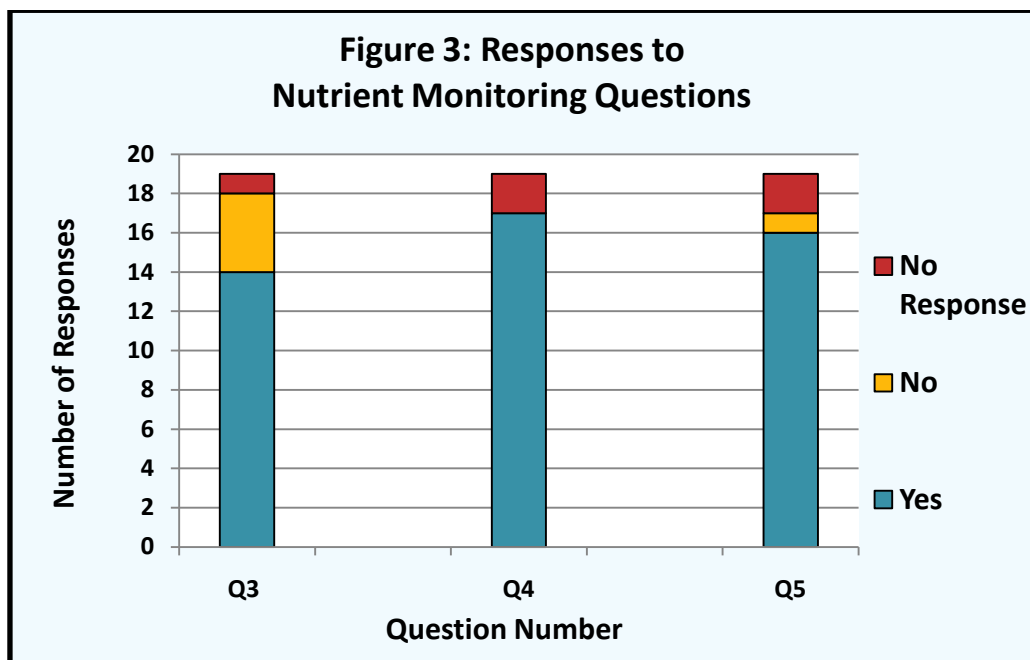
The increased number of LGA's testing golf courses is encouraging as they are another area where inappropriate fertilising and watering could result in the leaching of nutrients. The relatively low number of LGA's testing golf courses may be due to maintenance being tendered out or the golf course acting independently of the LGA. It is recommended that all LGA's promote testing of golf courses in their areas because they can be a significant source of nutrients to waterways.

The relatively large number of LGA's testing irrigated parks is encouraging. Over watering and/or overfertilising of turfed areas can result in nutrients being leached beyond the root zone to groundwater. It is strongly recommended that irrigated parks are regularly tested, especially for moisture, so that irrigation schedules can be adjusted accordingly to avoid leaching of nutrients from these areas and the wasting of water.

None of the LGA's testing dry grass areas could be an indication that fertiliser is not applied to these areas. If fertiliser is applied it is recommended that regular testing occur as nutrients can leach to groundwater from these areas in the wetter months.

It is encouraging that the number of LGA's conducting testing of foreshore reserves has increased, though there is a low number of LGA's testing these areas. However, this low number could be an indication of fertiliser not being applied to these areas or LGA's not having foreshore reserves. It is recommended that before fertiliser is applied to foreshore reserves that they are tested for nutrients, to avoid overuse of fertiliser, due to the close proximity of waterways.

Figure 3 shows the responses from Questions Three, Four and Five.



Question Three

Question Three asked whether the LGA had its analyses conducted by a laboratory affiliated with the *Australian Soil and Plant Analysis Council (ASPAC)*. Fourteen out of the nineteen LGA's that carry out tests have their analyses conducted by these affiliated laboratories. Compared to the 2008 survey the number of LGA's using an ASPAC affiliated laboratory has increased slightly.

It is encouraging that the majority of LGA's are using ASPAC laboratories. ASPAC laboratories offer quality assurance and standard procedures from experienced staff. It is recommended that LGA's use these laboratories for their analyses to ensure accurate information is received.

Questions Four and Five

Questions Four and Five were directly related to the monitoring of phosphorus. Question Four asked whether available phosphorus was measured by the standard Colwell method. Question Five was about measuring of the Phosphorus Retention Index (PRI). Seventeen of the nineteen LGA's measured available phosphorus in the soil by the standard Colwell method. Sixteen LGA's also tested the Phosphorus Retention Index (PRI) of the soil. Compared to the 2008 survey the number of LGA's that used the standard Colwell method and measured the PRI has remained the same.

It is encouraging that in most cases both the Colwell method (standard method for Western Australian conditions) and the PRI of the soil are being measured together to determine phosphorus levels in soils. Without both tests being conducted, an accurate interpretation of phosphorus levels cannot be achieved and thus inappropriate fertiliser regimes may be used. It is recommended that all LGA's use both tests, in conjunction, to determine phosphorus levels in soils and then apply results to the following table to determine if phosphorus applications are necessary. As a minimum, these tests should be conducted every second year.

Phosphorus Recommendations		
PRI	Soil Test P (Colwell test)	Recommendations
0 or negative		Do not apply P
1 - 2	< 7 ppm	Apply up to 5 kg P/ha
	> 7 ppm	Do not apply P
3 - 5	< 10 ppm	Apply up to 10 kg P/ha
	> 10 ppm	Do not apply P
> 5	< 10 ppm	Apply up to 20 kg P/ha

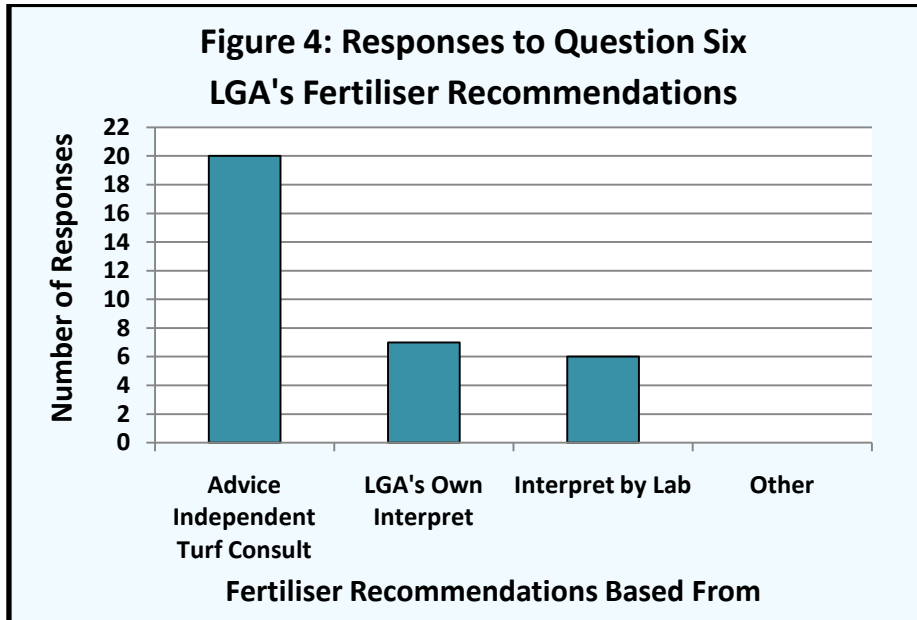
Source: Ruscoe, Johnston & McKenzie 2004, *Turf Sustain – A Guide to turf management in Western Australia*. Sports Turf Technology, Como, Western Australia.

Fertiliser Applications

Question Six

Question Six asked where the LGA's obtained their fertiliser recommendations. Seven LGA's had more than one response to this question. Figure 4 shows twenty of the LGA's received advice from independent turf consultants, seven interpreted the results themselves and six received interpretation from the laboratory. Compared to the 2008 survey, LGA's obtaining their fertiliser recommendations from turf consultants decreased moderately, LGA's interpreting the results themselves has decreased moderately and interpretation from the laboratory has increased moderately.

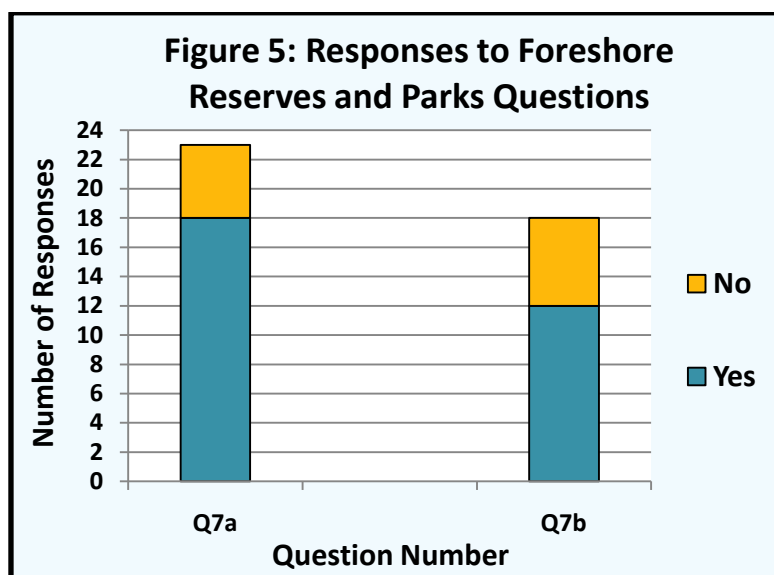
The multiple responses from some LGA's to this question indicated that experienced turf managers used their own judgement, blended with a consultants or the laboratories advice, to decide on a fertiliser program for different turf areas. It is encouraging that a range of opinions were utilised to determine application rates of fertiliser, rather than single sources, and it is recommended that this continue. The high level of advice from turf consultants, specifically trained in turf management, usually with many years of on ground experience, is highly desirable, and it is recommended that LGA's use their expertise to determine appropriate fertiliser regimes.



Question Seven

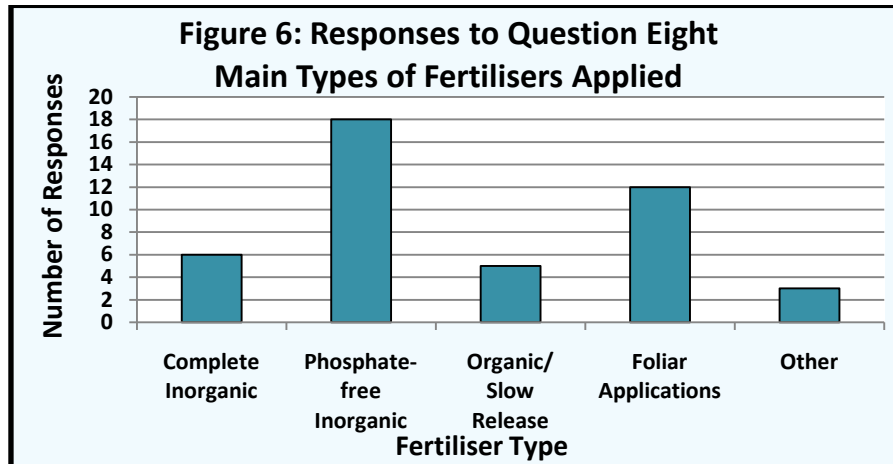
Question Seven asked if LGA's have foreshore reserves and parks and if they did if fertiliser was added to foreshore reserves and parks. As can be seen from Figure 5, eighteen LGA's did have foreshore reserves and parks. Of the eighteen, twelve LGA's added fertiliser to foreshore reserves and parks, with six LGA's not adding fertiliser. Compared to the 2008 survey, the number of LGA's fertilising foreshore reserves and parks has increased moderately.

This response is discouraging due to the increase in number of LGA's applying fertiliser to these potentially high risk areas where nutrients can enter waterways. Over half of the LGA's are applying fertilisers in these areas thus it is recommended that these LGA's test foreshore reserves before they apply fertiliser to these sensitive areas to avoid unnecessary nutrient applications. If nutrients are required then controlled release or low water soluble fertilisers should be applied. Fertiliser should not be applied in the winter months when heavy rainfall can wash nutrients into the waterway and irrigation needs to be carefully monitored so that overwatering also does not wash nutrients into the waterway. If possible, a 50 metre buffer zone should be established between fertilised areas and waterways (DoE, 2005).



Question Eight

Question Eight determined exactly what types of fertilisers the LGA's applied to turf areas as well as average application rates, number of applications and season majority of fertiliser applied. Fourteen of the LGA's had more than one response to the fertiliser type question. As can be seen from Figure 6, six of the LGA's used complete inorganic fertiliser, eighteen used phosphate-free inorganic, five LGA's used organic/slow release, twelve used foliar applications and three used other types of fertilisers. Compared to the 2008 survey the use of complete inorganic has decreased slightly, phosphate free inorganic has decreased moderately, organic/slow release has increased slightly, foliar applications have decreased slightly and other applications have increased moderately.



The responses to the average application rates, number of applications and season majority of fertiliser applied questions can be seen in Table 1. No comparisons have been made with the 2008 survey due to the complexity of the information obtained.

Fertiliser Type	If Applied, Combined Responses from LGA's:		
	Average application rate in kg/hectare	Number of applications in last year	Season majority of fertiliser applied
Complete inorganic	100-150 - 3 LGA's 120-200 - 1 200 - 1 210 - 1	One - 2 LGA's Two - 2 Three - 1 Four - 1 Five - 1	Spring - 4 LGA's Summer - 2 Autumn - 3 Winter - 0 All Year - 2
Phosphate-free inorganic	5 - 1 LGA 25 - 1 40 - 1 100-150 - 5 150 - 4 180 - 1 200 - 1 250-260 - 3 400 - 1 Did not specify - 3	One - 3 LGA's Two - 13 Three - 2 Four - 3 Five - 0 Six or greater - 1 Did not specify - 2	Spring - 15 LGA's Summer - 5 Autumn - 12 Winter - 5 All Year - 2 Did not specify - 2
Organic/slow release	50 - 1 LGA 100-150 - 1 250 - 1 400 - 1 Did not specify - 1	One - 0 LGA's Two - 3 Three - 1 Four - 1	Spring - 5 LGA's Summer - 3 Autumn - 2 Winter - 0 All Year - 0
Foliar applications	20 - 1 LGA 20 (Iron, magnesium) - 1 25 (Iron & manganese) - 2 (Ferrous sulphate 20%) - 1 25 (Ferrous sulphate) - 1 14 (Manganese sulphate) - 1 25 (Manganese sulphate) - 1 25 (Manganese 32%) - 1 25 (Nitrogen) - 1 40 (N, K, Fe, Mg) - 1 47 (Sulphate of ammonia) - 1 50 - 1 Did not specify - 4	One - 4 LGA's Two - 5 Three - 0 Four - 2 Five - 2 Did not specify - 1	Spring - 2 LGA's Summer - 3 Autumn - 3 Winter - 4 All Year - 2 Did not specify - 3
Other, please state	10 g/plant (Terracottem - native plant installation) - 1 LGA 100 (Blended Lawn Starter on new lawns) - 1 1000 (Gypsum) - 1	One - 2 LGA's Two - 1	Spring - 0 LGA's Summer - 1 Autumn - 0 Winter - 2 All Year - 0

Table 1: Responses from LGA's to fertiliser questions for each fertiliser type.

For the fertiliser type question more than one response from some of the LGA's indicated they were using specific fertilisers according to the soil's condition rather than using the same fertiliser for all conditions. It is recommended that the LGA's continue to apply fertilisers in this way.

It is encouraging that phosphate-free inorganic fertiliser is being used by a majority of LGA's. Many turfed areas do not require phosphorus and thus it should only be applied if testing reveals that it is needed. It should also be noted that high nitrogen levels in fertiliser can also cause problems in waterway systems. Thus LGA's should only apply nitrogen when testing indicates that it is required. It is very encouraging that foliar applications are also used by around half of the LGA's. This method of spraying nutrients on to the foliage of turf means that nutrients will mostly be taken up into the leaves, with only minimal amounts entering soil where it can be leached to groundwater and waterways.

As can be seen from Table 1 there was a significant variation between responses from LGA's for the different questions relating to each fertiliser type. This variation would be due to differences between LGA areas including (but not limited to): soil type, turf type, passive vs active turf, age of turf, location of turf, percentage of nutrients in fertiliser and whether nutrient monitoring of turf occurred. These variations make it hard to comment on whether best management practices are occurring in respect to application rates. The response to the number of applications question is promising with the majority of LGA's applying fertiliser with more than one application resulting in less nutrients being applied at one time. The question on season majority of fertiliser is applied is also promising with a large number of LGA's applying fertiliser in the spring and autumn months when turf is actively growing. On eleven occasions LGA's applied fertiliser in the winter months, while another six LGA's stated they fertilised all year which could include winter, which is disappointing as it is likely that nutrients applied will be leached from the soil in heavy rain. A large number of LGA's stated that they fertilised in the summer months and it should be noted that fertiliser should only be applied in summer if nutrient testing indicates it is required.

Due to the difficulty in assessing overall level of best management practices being utilised it is recommended that LGA's implement the following strategies to ensure a high level:

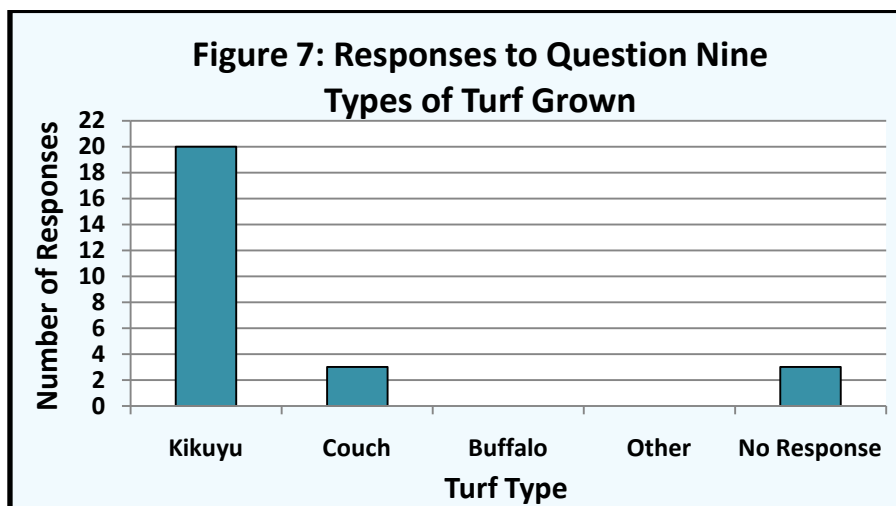
- The maximum nitrogen rate for a single application is 40 kg nitrogen/hectare (Ruscoe, Johnston & McKenzie, 2004).
- If fertiliser is required, apply in spring and/or early autumn (September, October, November, March and April) when grass grows rapidly. Apply the fertiliser in small amounts and often over these months instead of a single application. This will ensure all nutrients can be utilised by the turf.
- Do not fertilise in summer or winter. Summer fertilising encourages over use of water and turf may grow excessively while fertiliser applied during winter will be washed into stormwater drains or leached into groundwater.
- Do not apply fertiliser too close to hard surfaces such as roads. Fertiliser on hard surfaces will be washed into stormwater drains and end up in waterways. Also, do not apply fertiliser around the edges of wetlands and rivers where it can directly be washed into these waterways.
- Avoid applying fertiliser before heavy rainfall and do not over water turf as both actions could result in leaching of nutrients to groundwater and waterways.
- LGA's refer to the following publications (see Reference section for full publication details) to obtain more information on fertiliser and irrigation best management practices:
 - * *Turf Sustain – A guide to turf management in Western Australia*
 - * *Environmental Guidelines for the Establishment and Maintenance of Turf and Grassed Areas*
 - * *Stormwater Management Manual for Western Australia.*

Turf Type

Question Nine

Question Nine asked what is the main type of turf grown in the LGA's area. Three of the LGA's had more than one response to this question. As can be seen from Figure 7, twenty LGA's had kikuyu as their main turf type while three LGA's also used couch. None of the LGA's used buffalo while three LGA's did not respond. Compared to the 2008 survey the number of LGA's using kikuyu and couch has decreased slightly while the number not responding has increased moderately.

The response to this question is very encouraging with the majority of LGA's using kikuyu. It is recommended that LGA's continue to use kikuyu as their first choice for turfed areas due to its low fertiliser requirements, medium water usage, drought and wear tolerance and long growing season. Using kikuyu results in less nutrients and water having to be applied to turfed areas with less chance of leaching of nutrients occurring compared to other turf types. The LGA's that stated that they have couch in their area should note that fertiliser should not be applied to these areas in the winter months as the couch could be dormant and thus would not take up nutrients.



Nutrient Management

Question Ten

Question Ten enquired if measures are in place to prevent grass clippings from entering stormwater drains and if so what are these measures. Twenty of the twenty three LGA's stated that they did have measures in place preventing grass clippings from entering stormwater drains. Fourteen LGA's had more than one response to this question. The measures the LGA's have taken can be seen in Table 2. Compared to the 2008 survey the number of LGA's with measures in place and the measures taken have increased significantly.

Measure Taken	Number of LGA's Using Measure
Mower throw direction away from road verges/drains/waterways	11
Regular street sweeping	5
Clippings blown back onto turf	5
Grates over drains, interceptor traps, gross pollutant traps and comp basins	2
Mowers mowing verges and medians fitted with catchers	2
Clippings removed by Gallagher or vacuum	2
Clippings are collected (and composted)	2
Clippings left as cut, dethatched and removed once per year	1
Turf sweeping	1
Clippings spread over turf and remain in situ	1
Education of ratepayers through media releases	1
Care taken to avoid clippings being broadcast over roads	1
Mowing machinery washed down at works depot wash down facility	1
Regular mowing to reduce the amount of clippings	1
Clippings not blown onto roads or drains	1
Selective use of herbicides to reduce organic waste	1

Table 2: Measures taken by the twenty LGA's to prevent grass clippings entering stormwater drains.

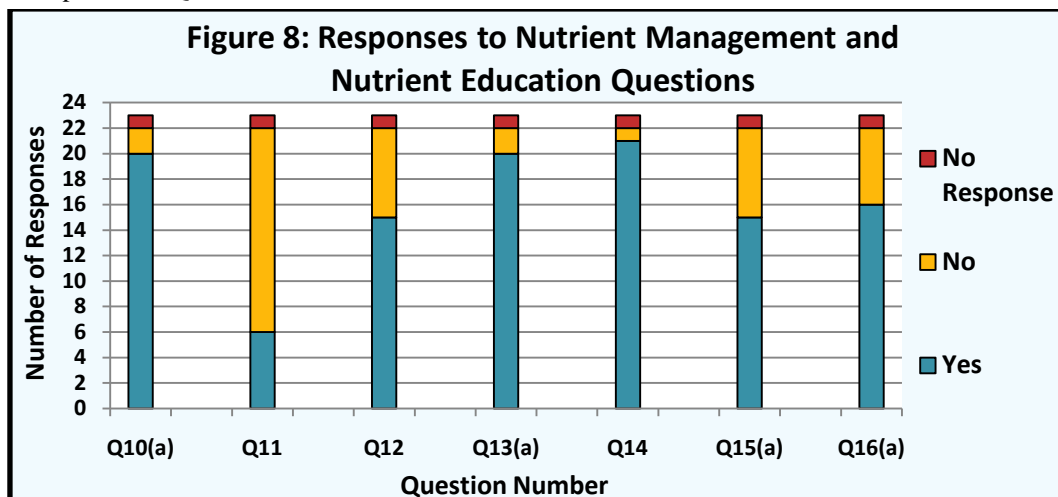
The high number of LGA's that have measures in place to prevent grass clippings from entering stormwater drains is promising. It is recommended however, that all LGA's implement measures, as grass clippings are high in nutrients that will end up in waterway systems if they are left on hard surfaces and enter stormwater drains. The majority of measures that the LGA's indicated they undertook to prevent clippings from entering drains are best management practices. It should be noted, however, that gross pollutant traps will not prevent grass clippings from entering waterways. Grates over drains and interceptor traps in stormwater drains would only be effective if cleaned out after each mowing session to ensure that the nutrients in the clippings do not enter waterways.

It is recommended that LGA's take the following measures to prevent grass clippings entering stormwater drains:

- Where practical LGA's should leave grass clippings on the mowed turf which returns the nutrients contained in the clippings back to the soil thus reducing fertiliser requirements. Clippings left in piles should be removed to disperse clippings.
- When mowing, clippings should be thrown away from hard surfaces.
- If clippings need to be removed they should be composted and then utilised as a soil amendment.
- Grass clippings that end up on hard surfaces such as roads and driveways should be swept up and removed (either manually or with a street sweeper) or blown off the hard surface back onto the turfed area.
- Grass clippings should never be blown, hosed or swept onto hard surfaces such as roads or driveways as they can be washed or blown into stormwater drains ending up in waterway systems.
- Mowing equipment should be cleaned down before going to the next location.
- When hosing down mowing equipment ensure that this water does not enter stormwater drains.

Further information can be obtained from the Department of Environment's 'Stormwater Management Manual for Western Australia' and the Department of Environmental Protection & Water and Rivers Commission's 'Environmental Guidelines for the Establishment and Maintenance of Turf and Grassed Areas'.

Figure 8 shows the responses to Questions Ten, Eleven, Twelve, Thirteen, Fourteen, Fifteen and Sixteen.



Question Eleven

Question Eleven asked if Nutrient and Irrigation Management Plans (NIMP) are implemented for streetscapes. Six of the twenty three LGA's that responded had a NIMP for their streetscapes while one LGA did not respond to this question. Compared to the 2008 survey the number of LGA's with NIMP for their streetscapes has increased moderately.

This low number is disappointing and it is recommended that NIMP be implemented for streetscapes. Streetscapes include median strips, roundabouts, entry statements, car park landscaping and road verges, which when combined are large areas within a LGA where nutrients and water usage should be controlled more appropriately. The use of local native species in streetscapes would reduce the need to water and fertilise in these areas. Refer to question twelve for information on using local native species in streetscapes.

Question Twelve

Question Twelve asked if LGA's have a policy to use local native plants as the first choice in public and private (Developers) landscaping. Fifteen LGA's had a local native plant policy as the first choice in landscaping. Compared to the 2008 survey the number of LGA's with local native plant policies has increased moderately.

Over half of the LGA's having this local native plant policy is encouraging but it is recommended that every LGA adopts this policy. The use of local native species in landscaping is encouraged as they require low levels of water and fertiliser and once established may require no further applications. This will result in reduced applications of water and nutrients in landscaped areas with less chance of leaching of nutrients from these areas.



Information on local native plant policies and using local native species is available from the Eastern Metropolitan Regional Council's Local Plants Landscaping Policy and Guidelines section of their 'Local Government Natural Resources Management Policy Manual' and from 'Sustainable Landscaping: Using Local Plants for Nutrient Reduction and Water Conservation' available from Perth Region NRM.

Question Thirteen

Question Thirteen asked if LGA's have deciduous trees in parks or streetscapes and if so what measures are taken to prevent deciduous leaves from entering stormwater drains. Twenty LGA's had deciduous trees in parks or streetscapes. Of the twenty with deciduous trees, eighteen LGA's had measures in place to prevent leaves from entering stormwater drains while two had no measures. Ten LGA's had more than one response to this question. The responses to what measures are taken to prevent leaves from entering drains can be seen in Table 3. Compared to the 2008 survey the number of LGA's with deciduous trees has remained the same while the number of LGA's with measures in place to prevent leaves from entering drains has increased moderately.

Measure Taken	Number of LGA's Using Measure
Regular street sweeping (including increased sweeping)	16
Crews requested to collect (manually)	6
Cleaning of drains (educting)	4
No measures taken	2
Grates on drains	2
Trees located in Public Open Space with leaf litter removed	1
More evergreen than deciduous trees	1

Table 3: Measures taken by the eighteen LGA's to prevent deciduous leaves from entering stormwater drains.

Nearly all the LGA's having deciduous trees in parks and streetscapes is very disappointing as the soft leaves that fall from these trees in the late autumn/early winter months decompose quickly releasing excessive nutrients in waterways. It is recommended that LGA's minimise the use of deciduous trees to prevent leaves from entering waterways and that LGA's do not plant deciduous trees along roads where their falling leaves can enter stormwater drains and then waterways. The use of local native plants would be an alternative to deciduous trees. Refer to question twelve for information on using local native species in parks and streetscapes.

The majority of LGA's having measures in place to prevent leaves from entering drains is very encouraging although it is recommended that all LGA's implement control measures. Most of the measures that the LGA's indicated they undertook to prevent leaves from entering drains are best management practices. It should be noted however, that in the late autumn/early winter months that street sweeping would need to be increased. Also grates on drains would not prevent deciduous leaves (or nutrients from leaves) from entering waterways unless they are cleaned out on a regular basis during the autumn and early winter months as deciduous leaves decompose readily.

Question Fourteen

Question Fourteen asked whether the council provided dog poo bins and bags in parks and foreshore reserves. Twenty one LGA's did provide these bins and bags in their parks while one LGA did not respond. Compared to the 2008 survey the number of LGA's providing bins and bags has remained the same.

The results from this question are encouraging, and should be continued, as dog poo is the second greatest source of phosphorus to waterways after fertiliser in urban areas.

Nutrient Education

Question Fifteen

Question Fifteen asked if measures are taken in foreshore reserves and parks to educate the public about not feeding bread to waterbirds and if yes what measures are taken. Fifteen of the twenty three LGA's had measures in place while one LGA did not respond. Six LGA had more than one response to this question. The measures that the LGA's used to educate the public on not feeding bread to waterbirds can be seen in Table 4. Compared to the 2008 survey the number of LGA's with measures in place to educate the public has increased moderately while the types of measures taken has increased slightly.

Measure Taken	Number of LGA's Using Measure
Interpretative signage	15
Public information/brochures	3
Advice from Rangers	1
Public education/visiting schools	1
Website	1
Upon request	1

Table 4: Measures taken by the fifteen LGA's to educate the public about not feeding bread to waterbirds.

The response to this question is promising with over half the LGA's implementing measures to educate the public about not feeding waterbirds. The high use of interpretative signage is very encouraging with information about the effects of feeding being provided at the site where it is occurring. The use of Rangers by one LGA to advise people is also very encouraging and an important measure to implement to deter bird feeders. It is strongly recommended however, that all LGA's, as a minimum, erect signage in foreshore reserves and parks educating the public about the effects of bread on waterways (eg. increased phosphorus levels and algal blooms) and waterbirds (eg. malnutrition, botulism and aggressive behaviour). The Phosphorus Awareness Project has a brochure which outlines this issue that could be the basis for signage.

It is also recommended that LGA's use other strategies to educate ratepayers about the effects of bread on waterways and waterbirds such as local media, environmental workshops, LGA newsletters, websites and brochures and the introduction of Local Laws (and enforcement of those laws) that prohibit the feeding of birds.

Question Sixteen

Question Sixteen asked if advice was provided to ratepayers about best practice in fertiliser management according to soil type and if provided the strategies used to provide this advice. Sixteen of the LGA's provided advice to their ratepayers. The responses as to how they provided this advice can be seen in Table 5. Compared to the 2008 survey the number of LGA's providing advice has increased significantly while how they provided this advice is similar.

Measure Taken	Number of LGA's Using Measure
On request (over the phone and written or counter/customer service enquiries)	7
Brochures/leaflets	4
Hosting Great Gardens Workshops	3
Fertilise Wise brochures at events	1
Fertilise Wise brochures on website	1
Website	1
Workshops	1
Local Plants brochure details the correct way to fertilise your garden	1
No Response	1

Table 5: Measures taken by the sixteen LGA's to provide advice to ratepayers about best practice in fertiliser management.

It is encouraging that over half of the LGA's are providing this advice to their ratepayers and the strategies for providing this advice are commendable. However, Local Plants brochures only outline how to correctly fertilise local native plant gardens and not lawns or exotic plant gardens thus other fertilising information may need to be considered. Ratepayer's lawns, when combined, would form the largest turfed area in a LGA. Householders generally have limited knowledge of best practice fertiliser management. It is recommended that LGA's provide advice to ratepayers on fertiliser practices. This will help to reduce the high levels of nutrients from fertilisers that leach through the sandy soils of the Swan Coastal Plain and into groundwater and waterways.

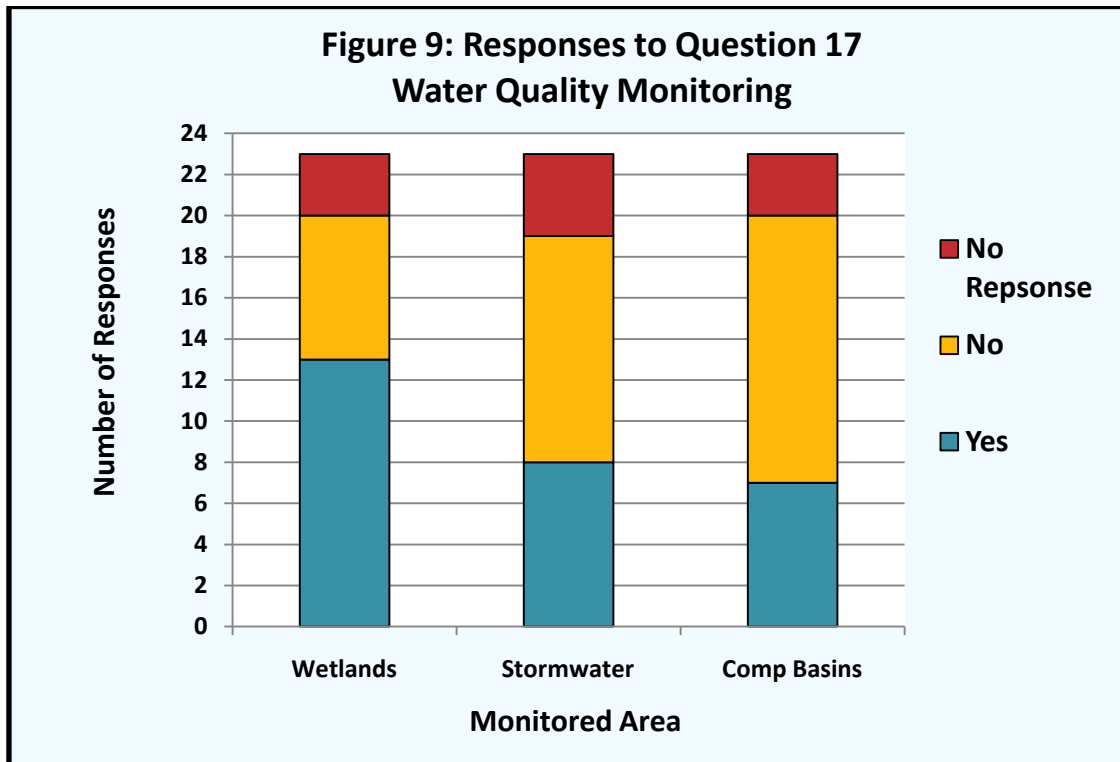
The Phosphorus Awareness Project produce 'Fertilise Wise' leaflets for the five main soil types in Perth. These leaflets contain information on fertiliser best management practices targeted at homeowners and are available for LGA's to distribute to their ratepayers. The 'Sustainable Landscaping: Using Local Plants for Nutrient Reduction and Water Conservation' initiative is available to help LGA's provide information to ratepayers on using local plants in gardens. LGA's could also host a 'Great Gardens' Workshop to educate ratepayers on fertiliser and water management and other garden issues. Workshops can be organised by contacting Landcare Solutions.



Water Quality Monitoring

Question Seventeen

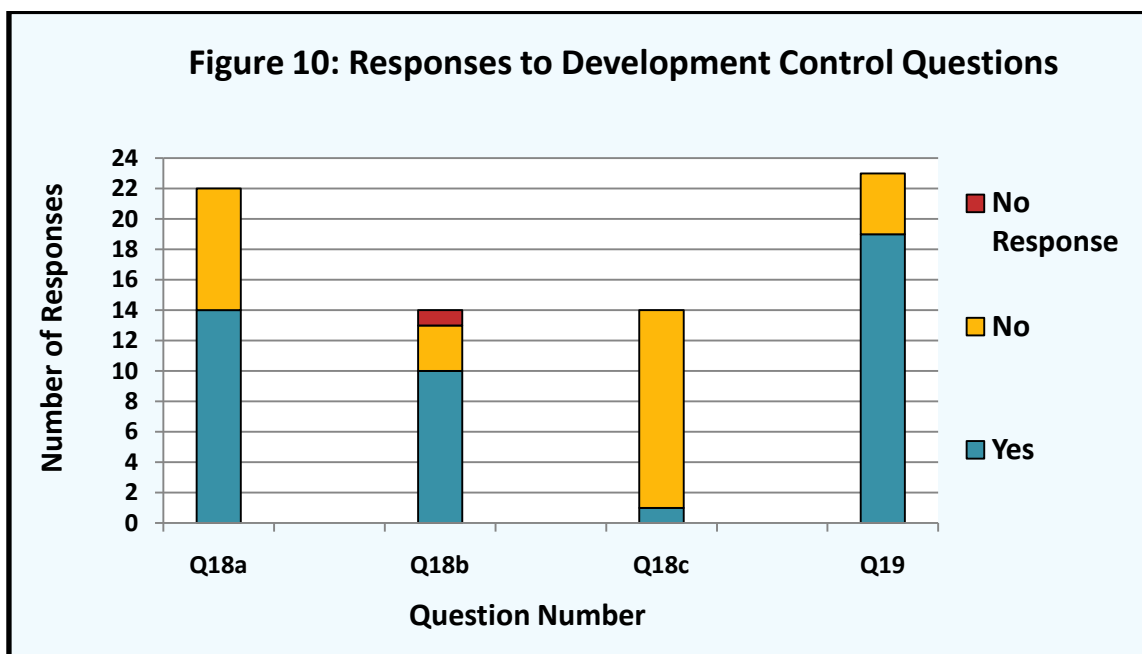
Question Seventeen asked about regular monitoring of wetlands, stormwater drains and compensation basins for nutrient levels and if these results were reported to the local community. As can be seen from Figure 9, thirteen LGA's monitored wetlands, eight monitored stormwater drains and seven also monitored compensation basins. Five of the LGA's that monitored reported these results to their local community. Compared to the 2008 survey monitoring of wetlands has increased slightly, monitoring of stormwater drains has increased moderately while monitoring of compensation basins has decreased moderately. Reporting these results to the community has increased slightly.



It is encouraging that half of the LGA's are monitoring wetlands and that monitoring of stormwater drains has increased while it is concerning that the monitoring of compensation basins has decreased moderately. It is recommended that monitoring of all these areas occur as they are sensitive areas that may be influenced by fertiliser applications on surrounding turf. This monitoring could also indicate if pollution is entering these systems from other sources upstream. Stormwater drains, compensation basins and wetlands are connected to the river systems through ground or surface water. There is a high potential that nutrients, algal blooms or other pollutants from these areas could enter the rivers.

Reporting these results to the community would reflect the LGA's commitment to the environment and provide important information to community catchment and environment groups. These groups could use this information to determine where rehabilitation of waterways and education of general community members needs to occur.

Figure 10 shows the responses from Questions Eighteen and Nineteen.



Development Control

Questions Eighteen and Nineteen

Questions Eighteen and Nineteen related to new developments. Question Eighteen asked if conditions are imposed on developments which include a Nutrient and Irrigation Management Plan. Monitoring for compliance as well as prosecution for lack of compliance was also addressed by this question. Fourteen LGA's imposed conditions on developments, ten of the fourteen LGA's monitored these for compliance and one had made a prosecution for lack of compliance in the last 12 months. Compared to the 2008 survey the number of LGA's imposing conditions has increased significantly while monitoring for compliance decreased significantly and prosecutions decreased slightly.

It is encouraging that over half the LGA's imposed conditions on development but it is imperative that all LGA's impose these conditions. It is disappointing that there was a decrease in the number of LGA's that monitored the developments for compliance. Many new developments, especially subdivisions, are major sources of nutrients to waterways and this could be reduced by monitoring for compliance. Only one of the LGA's prosecuting for lack of compliance could be an indication that developers are adhering to the conditions put on them. If this is not the case it is recommended that LGA's prosecute developers for their lack of compliance, not only to recoup costs for environmental damage but to deter the developers from not complying on future projects.



Question Nineteen asked if the LGA had provisions in the Town Planning Scheme or Planning Policies to enforce environmental conditions on development. Nineteen of the twenty three LGA's had provisions to enforce environmental conditions. Compared to the 2008 survey moderately more LGA's have these provisions.

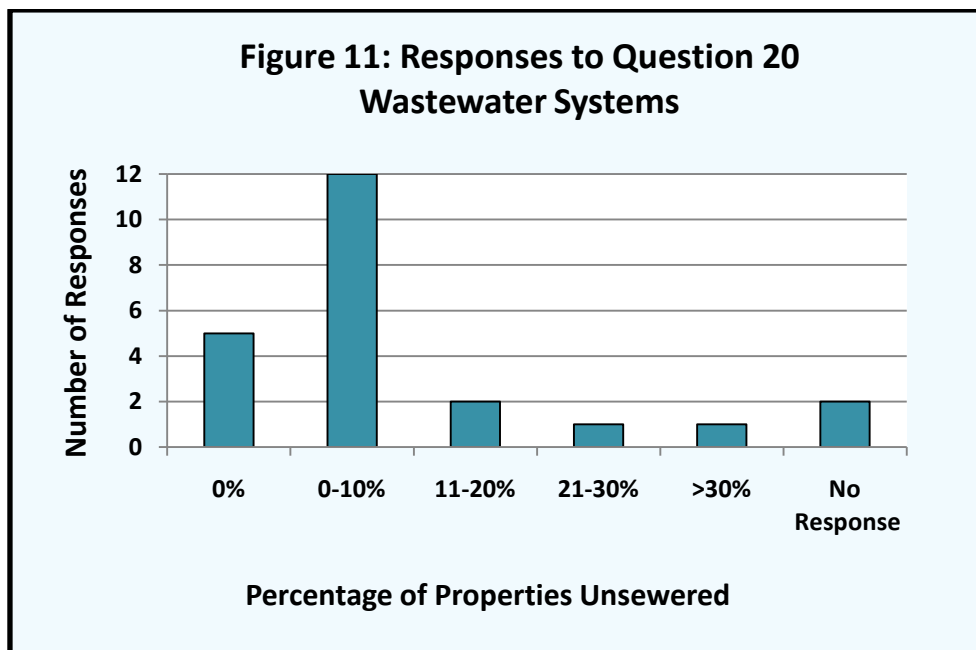
It is encouraging that over three quarters of the LGA's have provisions to enforce environmental conditions and it is recommended that the other LGA's introduce provisions to enforce these conditions. This may prevent environmental harm from occurring and will allow the LGA to prosecute if developers are not adhering to best management practices.

Wastewater Systems

Question Twenty

Question Twenty asked what percentage of properties in the LGA's urban zone were not connected to the sewer. As can be seen from Figure 11, five LGA's had 0% not connected to sewer, twelve had 0-10%, two had 11-20%, one had 21-30%, one had greater than 30% while two LGA's did not respond. Compared to the 2008 survey LGA's with 0% not connected to sewer has remained similar, 0-10% not connected has increased significantly, 11-20% has decreased moderately, 21-30% and greater than 30% are similar while the no response category has decreased significantly. The changes in the responses to this question, especially the number of LGA's with 0-10% of properties connected increasing significantly and the no response category decreasing significantly could be due to different LGA's and LGA Officers responding to the survey than in 2008.

Over the next few years, it is expected that the infill sewerage program will increase the number of LGA's that have 0% of properties unsewered. It is recommended that LGA's encourage householders to connect to the main sewerage line as leaking septic tanks can contribute nutrients to the river systems.



Annual Nutrient Survey for Local Government Authorities 2009

Recommendations

The following recommendations for each question, if implemented, will help LGA's to achieve a high level of nutrient best management practice.

Nutrient Monitoring

Question One – Does your LGA conduct regular soil tests and/or leaf tissue analysis for nutrients in grassed and turfed areas?

Recommendations

1. LGA's regularly conduct soil tests and/or leaf tissue analysis before applying fertiliser to determine if nutrients are required, and if required, the application rate and type of nutrients needed. This testing will result in unnecessary fertiliser applications being avoided.
2. The leaf tissue nitrogen content should be maintained between 1.5% - 2% for passive turf and 2% - 3% for sports fields (Ruscoe, Johnston & McKenzie, 2004).
3. The leaf tissue phosphorus content should be maintained between 0.2% - 0.4% (Ruscoe, Johnston & McKenzie, 2004).

Question Two – If yes for question no.1, for which areas? Areas - sports fields, golf courses, irrigated parks, dry grass areas and foreshore reserves. Tests – soil tests, leaf tissue analysis and moisture testing.

Recommendations

1. LGA's conduct soil testing and leaf tissue analysis of sports fields, irrigated parks, dry grass areas and foreshore reserves before applying fertiliser. This will result in unnecessary fertiliser applications being avoided.
2. LGA's regularly conduct moisture testing of these areas to avoid overwatering and the potential leaching of nutrients from these areas.
3. LGA's promote testing of golf courses in their areas because they can be a significant source of nutrients to waterways.

Question Three – Are analyses carried out by a laboratory affiliated with the *Australian Soil and Plant Analysis Council (ASPAC)*?

Recommendations

1. LGA's use ASPAC laboratories for their analyses so that accurate information is received.

Question Four - Is available phosphorus in the soil measured by the standard Colwell method?

Recommendations

1. LGA's measure the available phosphorus in the soil using the Colwell method (standard method for Western Australian conditions) to determine accurate levels of phosphorus, thus preventing unnecessary nutrient applications.

Question Five - Is the Phosphorus Retention Index (PRI) of soil measured?

Recommendations

1. LGA's measure the PRI of soil to determine the capacity of the soil to hold on to phosphorus, thus preventing unnecessary nutrient applications.
2. LGA's apply the analyses obtained from the Colwell method and PRI to the following table to determine if phosphorus applications are necessary. As a minimum, these tests should be conducted every second year.

Phosphorus Recommendations		
PRI	Soil Test P (Colwell test)	Recommendations
0 or negative		Do not apply P
1 - 2	< 7 ppm	Apply up to 5 kg P/ha
	> 7 ppm	Do not apply P
3 - 5	< 10 ppm	Apply up to 10 kg P/ha
	> 10 ppm	Do not apply P
> 5	< 10 ppm	Apply up to 20 kg P/ha

Source: Ruscoe, Johnston & McKenzie 2004, *Turf Sustain – A Guide to turf management in Western Australia*. Sports Turf Technology, Como, Western Australia.

Fertiliser Applications

Question Six - Are fertiliser recommendations based on either: advice from an independent turf consultant, LGA's own interpretation of results and experience, interpretation by the laboratory or other?

Recommendations

1. LGA's use a range of opinions to determine application rates and types of fertiliser, rather than single sources to ensure appropriate fertiliser regimes are being conducted.
2. LGA's use a turf consultant's expertise to determine fertiliser regimes as they are specifically trained in turf management, usually with many years on ground experience.

[Question Seven](#) – (a) Do you have foreshore reserves and parks? (b) Do you add fertiliser to foreshore reserves and parks?

Recommendations

1. If LGA's have foreshore reserves and parks they test these areas before applying fertiliser to avoid unnecessary nutrient applications which could leach into groundwater and nearby waterways.
2. If nutrients are required then controlled release or low water soluble fertilisers should be applied to reduce leaching of nutrients.
3. Fertiliser should not be applied in the winter months when heavy rainfall can wash nutrients into the waterway and irrigation needs to be carefully monitored so that overwatering also does not wash nutrients into the waterway.
4. If possible, establish a 50 metre buffer zone between fertilised areas and waterways (DoE, 2005).

[Question Eight](#) - In general, are the main types of fertilisers applied to established turf areas either: complete inorganic, phosphate-free inorganic, organic/slow release, foliar applications or other? If applied: Average application rate in kg/hectare? Number of applications in last year? Season majority of fertiliser applied?

Recommendations

1. LGA's use specific fertilisers according to the soil and leaf tissue analyses for each site rather than using the same fertiliser for all sites to ensure that all the nutrients are utilised by the turf and not leached into groundwater.
2. LGA's only apply phosphorus and nitrogen when testing indicates it is required to avoid leaching of nutrients that are not required by the turf.
3. The maximum nitrogen rate for a single application is 40 kg nitrogen/hectare (Ruscoe, Johnston & McKenzie, 2004).
4. If fertiliser is required, apply in spring or early autumn (September, October, November, March and April) when grass grows rapidly. Apply the fertiliser in small amounts and often over these months instead of a single application. This will ensure all nutrients can be utilised by the turf.
5. Do not fertilise in summer or winter. Summer fertilising encourages over use of water and turf may grow excessively while fertiliser applied during winter will be washed into stormwater drains or leached into groundwater.
6. Do not apply fertiliser too close to hard surfaces such as roads. Fertiliser on hard surfaces will be washed into stormwater drains and end up in waterways.
7. Avoid applying fertiliser before heavy rainfall and do not over water turf as both actions could result in leaching of nutrients to groundwater and waterways.
8. LGA's refer to the following publications (see Reference section for full publication details) to obtain more information on fertiliser and irrigation best management practices:
 - *Turf Sustain – A guide to turf management in Western Australia*
 - *Environmental Guidelines for the Establishment and Maintenance of Turf and Grassed Areas*
 - *Stormwater Management Manual for Western Australia.*

Turf Type

[Question Nine](#) - What is the main type of turf grown in your area: kikuyu, couch, buffalo or other?

Recommendations

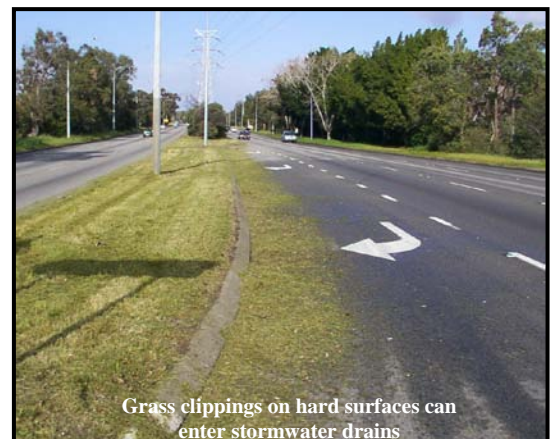
1. LGA's use kikuyu as the first choice for turfed areas as it has low fertiliser requirements, requires a medium water usage and is drought and wear tolerant.
2. LGA's with couch in their area should not fertilise this turf in the winter months as it could be in its dormant phase.

Nutrient Management

[Question Ten](#) - Do you have measures in place to prevent grass clippings from entering stormwater drains? If yes, please state what measures are taken.

Recommendations

1. LGA's have measures in place to prevent grass clippings from entering stormwater drains as they are high in nutrients and will end up in waterway systems.
2. Where practical LGA's should leave grass clippings on the mowed turf which returns the nutrients contained in the clippings back to the soil thus reducing fertiliser requirements. Clippings left in piles should be removed to disperse clippings.
3. When mowing clippings should be thrown away from hard surfaces.
4. If clippings need to be removed they should be composted and then utilised as a soil amendment.
5. Grass clippings that end up on hard surfaces such as roads and driveways should be swept up and removed (either manually or with a street sweeper) or blown off the hard surface back onto the turfed area.
6. Grass clippings should never be blown, hosed or swept onto hard surfaces such as roads or driveways as they can be washed or blown into stormwater drains ending up in waterway systems.
7. Mowing equipment should be cleaned before going to the next location.
8. When hosing down mowing equipment ensure that this water does not enter stormwater drains.



[Question Eleven](#) - Do you have a Nutrient and Irrigation Management Plan (NIMP) implemented for your streetscapes? (i.e. for median strips, roundabouts, entry statements, car park landscaping, road verges, etc)

Recommendations

1. LGA's implement NIMP for streetscapes, as they are large areas within a LGA where nutrients and water usage should be controlled more appropriately.

[Question Twelve](#) - Do you have a policy to use local native plants as the first choice in public and private (Developers) landscaping?

Recommendations

1. LGA's have a local native plant policy and plant local native species in their management areas as they require low levels of water and fertiliser and once established may require no further applications.
2. Information on local native plant policies and using local native species is available from the Eastern Metropolitan Regional Council's Local Plants Landscaping Policy and Guidelines section of their 'Local Government Natural Resources Management Policy Manual' and from 'Sustainable Landscaping: Using Local Plants for Nutrient Reduction and Water Conservation' available from Perth Region NRM.

[Question Thirteen](#) - Do you have deciduous trees in your parks or streetscapes? If yes, please state what measures, if any, are taken to prevent deciduous leaves from entering stormwater drains.

Recommendations

1. LGA's minimise the use of deciduous trees as their leaves decompose quickly releasing excessive nutrients in waterways.
2. LGA's do not plant deciduous trees along roads where their falling leaves can enter stormwater drains and then waterways.
3. LGA's use a street sweeper, on a regular basis, during the autumn months when deciduous leaves lose their leaves to prevent leaves entering stormwater drains and then waterways.

[Question Fourteen](#) - Do you provide dog poo bins and bags in your parks and foreshore reserves?

Recommendations

1. LGA's provide dog poo bins and bags in parks and foreshore reserves as dog poo is a major contributor of nutrients to groundwater and waterways.

Nutrient Education

[Question Fifteen](#) - Are measures taken in foreshore reserves and parks to educate the public about not feeding bread to waterbirds? If yes, please state what measures are taken.

Recommendations

1. LGA's erect signage in foreshore reserves and parks educating the public about the effects of bread on waterways (eg. increased phosphorus levels and algal blooms) and waterbirds (eg. malnutrition and aggressive behaviour). The Phosphorus Action Group has a brochure which outlines this issue that could be the basis for signage.
2. LGA's distribute information to their ratepayers about the effects of bread on waterways and waterbirds through local media, environmental workshops, LGA newsletters, website and brochures.
3. LGA's introduce Local Laws (and enforce those laws) that prohibit the feeding of birds.

[Question Sixteen](#) - Do you provide advice to ratepayers on best practice in fertiliser management according to soil type? If yes, please state how advice is provided to ratepayers.

Recommendations

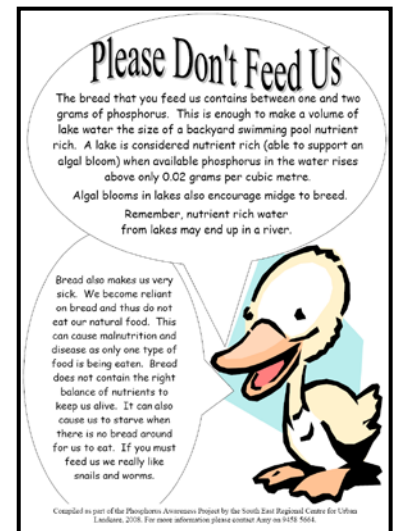
1. LGA's provide advice to ratepayers on fertiliser practices as ratepayers generally have limited knowledge of fertiliser management and would, when combined, have the largest turfed area in the LGA.
2. 'Fertilise Wise' leaflets are available from the Phosphorus Awareness Project to distribute to ratepayers.
3. LGA's host a 'Great Gardens' Workshop to educate their ratepayers on fertiliser and water management and other garden issues. Workshops can be organised by contacting Landcare Solutions.
4. 'Sustainable Landscaping: Using Local Plants for Nutrient Reduction and Water Conservation' initiative is available from Perth Region NRM to help LGA's provide information to ratepayers on using local plants in gardens.

Water Quality Monitoring

[Question Seventeen](#) - Do you regularly monitor the following areas under your control for nutrient levels and do you report these results to your local community? Areas – wetlands, stormwater drains, compensation basins.

Recommendations

1. LGA's regularly monitor wetlands, stormwater drains and compensation basins for nutrient levels to determine if pollution is occurring and potentially pinpoint sources.



2. LGA's report these results to the local community reflecting their commitment to the environment and providing important information to community catchment and environment groups to determine where rehabilitation of waterways and education of general community members needs to occur.

Development Control

Question Eighteen – (a) Do you impose conditions on developments which include Nutrient and Irrigation Management Plans (NIMP)?

(b) Do you monitor these for compliance?

(c) Have you made any prosecutions for lack of compliance in the last 12 months?

Recommendations

1. LGA's impose NIMP conditions on developments, monitor these for compliance and prosecute for lack of compliance as new developments are potentially major sources of nutrients to groundwater and waterways.

Question Nineteen - Do you have provisions in the Town Planning Scheme or Planning Policies to enforce environmental conditions on development?

Recommendations

1. LGA's introduce Town Planning Scheme provisions or Planning Policies to enforce environmental conditions on developments to prevent environmental harm and allow the LGA to prosecute if developers are not adhering to best management practices.

Wastewater Systems

Question Twenty - What percentage of properties in your urban zoned land is either unsewered or if sewerred is not connected to sewer? (Subdivisions less than 1 ha) Percentages - 0%, 0-10%, 11-20%, 21-30% or >30%.

Recommendations

1. LGA's encourage householders to connect to the main sewerage line when or if the infill sewerage program comes into the area as leaking septic tanks can contribute nutrients to groundwater and waterways.

References and Contacts for Further Information

- Department of Environment (2005) *Stormwater Management Manual for Western Australia*. Department of Environment, Perth, WA.
Available from the Department of Water - www.water.wa.gov.au
- Department of Environmental Protection & Water and Rivers Commission (2001) *Environmental Guidelines for the Establishment and Maintenance of Turf and Grassed Areas*. Department of Environmental Protection & Water and Rivers Commission, Perth, WA.
Available from the Department of Environment and Conservation - www.environment.wa.gov.au
- Fertilise Wise Guides and Feeding Water Bird brochures
Available from the Phosphorus Awareness Project – www.sercul.org.au/paghelp.html or by phoning 9458 5664.
- Great Gardens Workshops
Available from Landcare Solutions – www.greatgardens.info or by phoning 1300 369 833.
- *Local Plants Landscaping Policy and Guidelines - Local Government Natural Resources Management Policy Manual*. Available from the Eastern Metropolitan Regional Council - www.emrc.org.au/environmental.asp or by phoning 9424 2222.
- Ruscoe, Johnston & McKenzie (2004) *Turf Sustain – A Guide to turf management in Western Australia*. Sports Turf Technology, Como, WA.
Available from Sports Turf Technology - www.sportsturf.net.au or by phoning 9367 3568.
- *Sustainable Landscaping: Using Local Plants for Nutrient Reduction and Water Conservation*
Available from Perth Region NRM by phoning 9374 3333.