Department of Sustainability and Environment

Action Statement

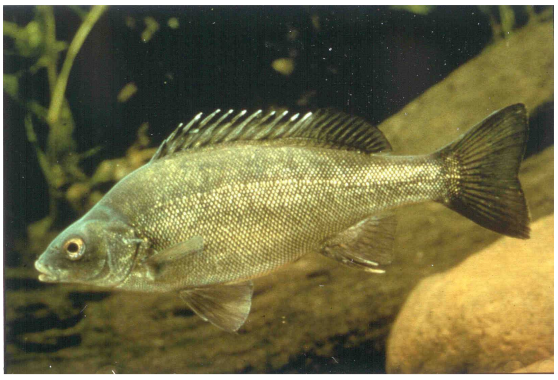
Flora and Fauna Guarantee Act 1988 No. 202

Silver Perch

Bidyanus bidyanus

Preamble

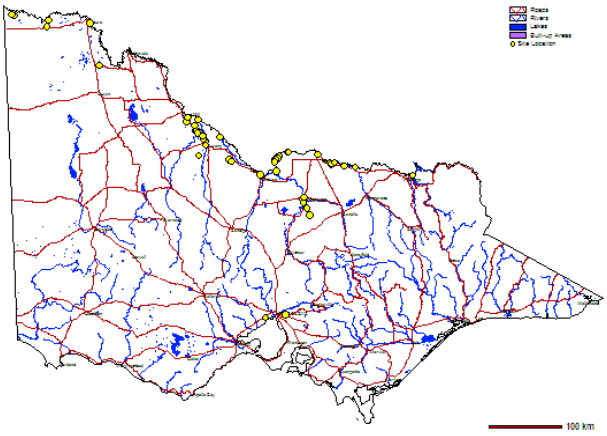
The information contained within this Action Statement has been collated from a number of sources (as listed in the reference section of this document). Most of the information, however, has been derived largely from two documents: *Silver Perch: A Recovery Plan* (Clunie and Koehn 2001a) and *Silver Perch: A Resource Document* (Clunie and Koehn 2001b). Both of these documents, as well as this Action Statement, have been written to provide background information and a list of achievable goals to natural resource managers with the aim to address the decline in distribution and abundance of this species.



Silver Perch (*Bidyanus bidyanus*)
Photo: Rudi Kuiter

Description and distribution

Silver Perch (*Bidyanus bidyanus* Mitchell, 1838) is a moderate to large fish with a strongly compressed elongate-oval body covered in small, thin scales. The scales have dark margins, which gives the fish a reticulate appearance. Fish to 610 mm and 8 kg have been recorded. More commonly, however, they reach 410 mm and 2.5 kg. The head is small with a convex dorsal profile, terminating in a small mouth with upper and lower jaws of equal length; the operculum has two flat spines (the lower being larger). The eyes are small and are positioned high on the head close to the dorsal profile. Silver Perch have a single, long-based dorsal fin divided into two sections, the anterior section is deeply notched between each of the 12 large spines, and is followed by the soft-rayed posterior section. The short-based anal fin has three prominent spines followed by a soft-rayed section, and the caudal fin is weakly forked. A scaly sheath covers the bases of both the anal and dorsal fins. The lateral line is continuous, but not prominent. Colour varies with water turbidity but is generally dark



Distribution in Victoria

(Victorian Fauna Database, DSE 2007)

Victoria
The Place To Be

grey to grey-brown dorsally, fading to silver laterally and white ventrally, while the fins are whitish to grey (Cadwallader and Backhouse, 1983).

The natural range of Silver Perch includes most of the Murray-Darling drainage basin, excluding the cool, higher altitude upper reaches of streams on the western side of the Great Dividing Range (Merrick 1996), and includes southern Queensland, western New South Wales, northern Victoria and South Australia (Cadwallader and Backhouse, 1983).

In Victoria, Silver Perch have been recorded from 12 river basins. Populations occur naturally in eight of these: the Upper Murray (Lake Hume stocking), Ovens River, Broken River, Goulburn River, Campaspse River, Loddon River, Murray Riverina and the Mallee. Silver Perch have been introduced into the other four river basins: Wimmera River, Yarra River, Werribee River and Corangamite. The majority of records are from the Goulburn River, Loddon River, Murray Riverina, and Mallee.

Habitat

Little detailed information is available concerning the habitat preference of Silver Perch, possibly as a result of the wide range of habitats in which they have been recorded throughout the Murray-Darling system. These habitats include rivers and large streams, as well as lakes and impoundments. Rowland (1995) noted that the species occurs in both the cooler, clearer, upper reaches of the Murray Darling River system with gravel beds and rocky substrates, as well as in the turbid, slow flowing rivers in the west and north. While Silver Perch may be found in a range of conditions, Merrick and Schmida (1984) noted they prefer fast flowing waters, particularly where there are rapids and races. In Victoria, Cadwallader and Backhouse (1983) indicated that open waters were preferred to those that were heavily snagged. In Sevens Creek, Victoria, Cadwallader (1979) recorded Silver Perch in situations where cover was provided by debris, occasional stands of *Phragmites* and where the water was very turbid. Surveys conducted in the Murray River in June 1996 recorded the capture of Silver Perch mainly from open waters off sandy beaches (J. Koehn, DNRE, unpubl. data). Silver Perch is one of the only larger native fish species which appears near the water surface (Lake 1967c).

Life history and ecology

Silver Perch generally spawn in spring and summer when water levels increase and water temperatures rise above 23 °C (Lake 1967a). Spawning has, however, been observed at temperatures of 21.6°C (Thurstan and Rowland 1995). Spawning may occur in flooded backwaters of low gradient streams (Lake, 1967c) as well as in impoundments (Hogan, 1995), provided an increase in both water level and temperature occur. It is clear from these requirements that alterations to natural flooding and water temperature regimes have the capacity to seriously affect the spawning behaviour and potential spawning success of Silver Perch

Spawning has been observed to occur in schools of 50 to 70 fish with females surrounded by males, followed by vigorous activity (sometimes with several males chasing a female (Lake 1967b)) at which time both eggs and sperm are released into the water column. This behaviour was observed five or six times at intervals of 20 to 30 minutes (NSW fisheries 1915). Lake (1967b) noted that some individuals died following spawning.

Fecundity varies with fish size: up to around 500,000 eggs have been recorded from a 1.8 kg female, but approximately 300,000 eggs is more typical. Eggs are spherical, pelagic, non-adhesive, semi-buoyant, colourless and about 2.5-3 mm in diameter when water hardened (Thurstan and Rowland, 1995). Eggs are pelagic and drift downstream with the current; in still water, however, they will settle to the bottom (Cadwallader and Backhouse 1983). There is no apparent parental care of eggs following spawning (Lake, 1967b). Eggs hatch rapidly (within 28-31 hours at temperatures of 24-27 °C), and juveniles are free swimming by 5 days and commence feeding at 4-6 days (Lake 1967d, Guo *et al.* 1993).

Silver Perch migrate entirely in freshwater, usually after water temperatures increase above 20 °C. A wide variety of ages undergo upsteam migration (sometimes over extensive distances). Immature fish move upstream from October to April, while mature fish move upstream over a shorter period from November to February (Mallen-Cooper *et al.* 1995). Increased migration has also been observed after increases in flow (Clunie and Koehn, 2001b). The upstream migration of juvenile Silver Perch is thought to be for one or more of the following strategies: to optimise feeding, to enhance colonisation, or to compensate for the downstream drift of pelagic eggs and larvae (Mallen-Cooper et al 1995). The pelargic nature of Silver Perch eggs and larvae (they drift downstream for 12 to 15 days) is believed to be one of the factors responsible for the upstream migration of mature Silver Perch prior to spawning (Mallen-Cooper *et al.* 1995). Barriers to migration are believed to adversely affect these strategies

Silver Perch are omnivorous, taking such items as zooplankton, crustaceans, aquatic insects and algae; the proportion of algae in the diet increases with age (Clunie and Koehn, 2001b).

Conservation status

National conservation status

Silver Perch is not listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.*

The Australian Society for Fish Biology considers Silver Perch to be 'vulnerable' in Australia (ASFB 2004).

Victorian conservation status

Silver Perch is listed as 'threatened' under the *Flora and Fauna Guarantee Act 1988* (FFG Act).

It is considered 'critically endangered' in Victoria according to DSE's *Advisory List of Threatened Vertebrate Fauna in Victoria – 2007* (DSE 2007).

Decline and threats

The decline in distribution and abundance of Silver Perch has been formally described in the process of nomination of this species under the FFG Act on the basis of the following criteria:

Criterion 1.1 ***The taxon is in a demonstrable state of decline which is likely to result in extinction.***

Silver Perch have not been recorded recently from Seven Creeks or from natural populations above Lake Mulwala. The decline of 93% of Silver Perch passing through the Euston fishway on the Murray River in the past 50 years (Mallen-Cooper 1992) indicates a massive decline, which has direct impacts on the Victorian populations.

Criterion 1.2 ***The taxon is significantly prone to future threats which are likely to result in extinction.***

Silver Perch is threatened by instream barriers which prevent upstream migrations. Instream barriers may also alter flow and temperature regimes, thereby affecting spawning success and the survival of eggs and juveniles (Koehn and Morrison 1990). Competition for food from introduced cyprinids and predation by Redfin (*Perca fluviatilis*) may also represent a threat.

Sub-Criterion 1.2.1 ***The taxon is very rare in terms of abundance and distribution***

The CNR (DSE) Freshwater Database only has records for a few hundred naturally occurring Silver Perch in Victoria since the early 1980s. The majority of site records are for only a few fish.

The data presented on distribution and abundance are the result of reasonable surveys, and provide clear evidence that the taxon is rare in terms of abundance and distribution.

Although the decline of Silver Perch populations in Victoria is most likely a result of a combination of factors, knowledge of the specific requirements of this species allows us to make informed assessments of the severity of these threats. These threats are listed below in descending order of perceived level of threat:

Alteration of temperature regimes

Cold water pollution (from low level outlets on dams) may lead to localised extinctions downstream of large dams if water consistently fails to reach temperatures required for spawning (23 ºC). Upstream migration (triggered at temperatures above 20 ºC) (Mallen-Cooper *et al.* 1995) may also be affected, as may metabolic functioning and growth, feeding, maturation and food availability (Clunie and Koehn 2001b, Ryan *et al.* 2004). 'The alteration to the natural temperature regimes of rivers and streams' is listed as a potentially threatening process under the *Flora and Fauna Guarantee Act 1988*

River regulation

River regulation may affect spawning success because spawning is at least partially initiated by rises in water level. There is some evidence that adults move upstream prior to spawning, and adult movement patterns may also be affected. River regulation may also alter both the quality and availability of floodplain habitats such as backwaters and billabongs in which Silver Perch have been recorded (Clunie and Koehn, 2001b). The recruitment of Silver Perch may be more localised and opportunistic than previously believed, and fish may spawn both during in-channel flows and during large floods (Clunie, pers. comm.). Research on recruitment patterns and preferences should be undertaken to further elucidate requirements for this species. 'The alteration to the natural flow regimes of rivers and streams' is listed as a potentially threatening process under the *Flora and Fauna Guarantee Act 1988.*

Barriers

Barriers to migration may limit or prevent adults and juveniles accessing upstream habitats, and consequently prevent their dispersal and access to feeding areas and their ability to compensate for downstream drift of eggs and larvae. This may result in the local extinction of Silver Perch in affected stretches of river. Furthermore, eggs and larvae may settle out in the low flow areas immediately above barriers, subjecting them to conditions which threaten their survival. Barriers may also cause physical injury and/or mortality to drifting eggs and larvae (Clunie and Koehn, 2001b). 'Prevention of passage of aquatic biota as a result of the presence of instream structures' is listed as

a potentially threatening process under the *Flora and Fauna Guarantee Act* 1988.

Introduced species

Carp

While the exact impact of Carp (*Cyprinus carpio*) on Silver Perch is not clear, perceived problems include competition for food resources and increased sedimentation due to the feeding habits of Carp. The impacts of increased sedimentation are outlined in the 'Sedimentation' section below.

Redfin

Although the impact of Redfin (*Perca fluviatilis*) on Silver Perch is unknown, it is likely that there is a degree of dietary overlap between the two species, particularly with zooplankton and insect larvae. It is also distictly possibile that Redfin prey on Silver Perch juveniles, larvae or eggs (Clunie and Koehn, 2001b)

'The introduction of live fish into waters outside their natural range within a Victorian river catchment after 1770' is listed as a potentially threatening process under the *Flora and Fauna Guarantee Act* 1988.

Sedimentation

Deposited sediments may be detrimental to eggs and larvae of Silver Perch, particularly in still water habitats such as backwaters, floodplains and weir pools when the majority of sediment is transported during high flow events. If these events occur when Silver Perch spawn and eggs and larvae settle in still waters, reproductive success may be reduced. Deposited sediment may reduce gas exchange and inhibit development of eggs, larvae and juveniles (Clunie and Koehn 2001b); high levels of mortality of silt-covered eggs have been recorded for other freshwater fish species (Koehn, DNRE, unpublished data). Sedimentation may also affect the abundance of food items such as phytoplankton, zooplankton and insects associated with aquatic macrophytes (Clunie and Koehn 2001b). It is not known whether high suspended sediment levels affect respiration or feeding in Silver Perch, emphasising the need for research on this subject. 'The increase in sediment input into Victorian rivers and streams due to human activity' is listed as a potentially threatening process under the *Flora and Fauna Guarantee Act* 1988

Loss of aquatic vegetation

Although the significance of aquatic vegetation as a habitat component for Silver Perch is unknown, it is possible that aquatic vegetation provides nursery habitat for juveniles. Aquatic vegetation also supports assemblages of aquatic insects which are in turn a food source for Silver Perch (Clunie and Koehn 2001b).

Salinity

Recent research indicates that Silver Perch appear quite tolerant to high salinity levels, although (like most fish species) early life history stages are the most sensitive. The effects of sub-lethal levels of salinity on Silver Perch (including stress which may make them more susceptible to infections) are unknown, as are the effects of elevated salinity levels on food sources such as invertebrates, algae and macrophytes. Impacts on habitat complexity and quality are also largely unknown and should be the topic of further investigation.

Riparian vegetation

The specific impacts of degradation and destruction of riparian vegetation on Silver Perch have not been determined. Generally accepted adverse effects on instream habitat include loss of shading, loss of organic inputs, increased runoff, increased erosion, streambank slumping and sedimentation. Such changes may have affected Silver Perch in relation to food sources, water quality and breeding success. 'Degradation of native riparian vegetation along Victorian rivers and streams' is listed as a potentially threatening process under the *Flora and Fauna Guarantee Act* 1988

Disease

Very little is known about the prevalence of diseases in Silver Perch. However, three diseases and one parasite have been identified as potential threats. These are: Epizootic Haematopoietic Necrosis Virus (EHNV) to which Silver Perch has been found to be highly susceptible, Viral Encephalopathy and Retinopathy (VER) which has been demonstrated to cause mortalities of Silver Perch in trials, Goldfish Ulcer Disease (GUD), and Asian Fish Tapeworm (Langdon, 1989, Glazebrook, 1995, Whittington *et al.,* 1995 and Dove *et al.*, 1997). Native fish are generally believed to become infected with these diseases following contact with introduced fish species (which act as vectors).

Algal blooms

It is not known whether algal blooms have played a significant role in the decline of Silver Perch, or whether associated water quality problems have had less obvious, sublethal effects. Considering that algae has been recorded as a significant component of Silver Perch diet, research on the effects of algal blooms is warranted.

Removal of woody debris

The significance of woody debris as a habitat component (including habitat markers, refuges from high water velocity, protection from predators, or nursery sites for larvae and juveniles) for Silver Perch is unknown. However, food items of Silver Perch include rotifers, chironomid larvae and small crustaceans, all of which are found on woody debris. Specific research on habitat preferences of Silver Perch will further clarify the role of woody debris in its life cycle. 'Removal of wood debris from Victorian streams' is listed as a potentially threatening process under the *Flora and Fauna Guarantee Act* 1988

Stockings and translocations

Inappropriate breeding and stocking programs (either for recreation or conservation) where limited numbers of broodstock are used may ultimately be detrimental to the long-term survival of Silver Perch. It is crucial that breeding programs in hatcheries maximise the genetic composition of stocks. Actions to ensure this include avoiding inbreeding through appropriate broodstock management practices, and the use broodstock which are representative of the area to be stocked (preferably from the same catchment) (Bearlin and Tikel, 2002)

Existing conservation measures

- A Silver Perch recovery plan has recently been published for the Murray Darling Basin commission (Clunie and Koehn, 2001) which addresses conservation issues for this species as well as recommendations for conservation actions and research.
- A Silver Perch recovery plan for NSW waters (prepared by NSW fisheries) is currently in draft form which addresses conservation issues for this species as well as recommendations for conservation actions and research.
- The Native Fish Management Strategy for the Murray Darling Basin (Koehn and Nicol, 2003) notes that altered flow regulation practices to enhance the restoration of native fish populations should be given a high priority.
- Angling for Silver Perch is subject to the following limitations for the protection of Silver Perch:
    - North of the Great Dividing Range: A maximum of five Silver Perch (of no less than 25cm) can be taken only from lakes and impoundments.
    - South of the Great Dividing Range (including the Wimmera Basin): A maximum of five Silver Perch (of no less than 25cm) may be taken.
- Recommendations to ameliorate fish passage issues in the Murray Darling Basin are addressed in the draft Murray Darling Basin report on barriers to fish migration (MDBC, in prep.). The Murray Darling Basin Commission has also made a large investment in the 'Hume to the sea' program which aims to modify existing in-stream structures that are considered barriers to fish migration.
- The National Carp Management Strategy for the Murray Darling Basin sets out goals and strategies for carp control (MDBC, 2000).
- Carp have been declared a noxious aquatic species in Victoria and must (by regulation) not be returned to the water once captured.
- The stocking of Redfin in public or private waters in Victoria is prohibited under the Fisheries Act 1995.
- The issues associated with translocation and stocking of native fish (including Silver Perch) within the Murray-Darling Basin have been addressed in a workshop held in Canberra during 25-26 September 2002 (WWF, 2003).

Conservation objectives

Long-term objective

To ensure that the Silver Perch can survive, flourish and retain its potential for evolutionary development in the wild.

Objectives of this Action Statement

1. Establish the extent and density of populations of Silver Perch within at least six sites in Victoria to ensure adequate baseline data is available for the assessment of management actions contained within this publication.
2. Ensure that management agencies and key stakeholders are aware of the presence of significant Silver Perch populations and that the species' conservation needs are included in relevant management programs.
3. Assess and manage threats to Silver Perch.
4. Ensure that suitable water quality and quanity (supplied at appropriate times of the year) is provided to sites supporting significant populations of Silver Perch.
5. Investigate the use of re-introductions of Silver Perch to improve the status of the species, and initiate at least two re-introductions into appropriate sites within Victorian waters.
6. Improve knowledge of the biology of Silver Perch.

Intended management actions

Note: The intended management actions listed below are further elaborated in DSE's Actions for Biodiversity Conservation (ABC) system. Detailed information about the actions and locations, including priorities, is held in this system and will be provided annually to land managers and other authorities. The targets specified below are intended to be met within the 5 year life of this Action Statement.

Objective 1 Establish the extent and density of populations of Silver Perch within at least six sites in Victoria to ensure adequate baseline data is available for the assessment of management actions contained within this publication.

1. Undertake surveys of areas where extant populations are believed to occur to determine the status of the species in these areas.

Target: Develop a standardised (comparable) methodology for sampling within the first year of Action Statement (AS) publication, and conduct surveys in historical and current range of the species to provide meaningful data within 5 years of AS publication

Responsibility: DSE (Biodiversity & Ecosystem Services Division), DPI (Fisheries Victoria)

2. Monitor selected sites to determine the impact of management changes on Silver Perch populations.

Target: Using standardised methodology (developed under Action 1), monitor population structure in at least 5 sites within the first 5 years of Action Statement publication

Responsibility: DSE (Biodiversity & Ecosystem Services Division), DPI (Fisheries Victoria)

Objective 2 Ensure that management agencies and key stakeholders are aware of the presence of significant populations of Silver Perch and that their conservation needs are included in relevant management programs.

3. Provide information and advice to management authorities such as Catchment Management Authorities, water authorities and local government authorities regarding the location and ecological requirements of all significant populations of Silver Perch.

Target: Conduct education and awareness days (including printed information for dissemination) to appropriate target audience on a bi-yearly basis

Responsibility: DSE regional offices with assistance from Fisheries Victoria and DSE (BES)

4. Develop and distribute a range of community awareness products (brochures, posters, media articles, talks) to promote conservation of Silver Perch.

Target: Prepare printed information and disseminate to relevant angling groups and wider community within 2 years of publication of this Action Statement and thereafter as deemed appropriate.

Responsibility: DSE (Biodiversity & Ecosystem Services Division)

Objective 3 Assess and manage threats to Silver Perch.

5. Maintain current controls over angling. Review controls periodically, especially when new information about Silver Perch distribution, population trends or the impact of angling is obtained.

Target: Review impacts of fishing on Silver Perch every 5 years or more frequently if relevant information becomes available.

Responsibility: DSE (Biodiversity & Ecosystem Services Division), Department of Primary Industries (Fisheries Victoria)

6. Include significant populations of Silver Perch as priorities for consideration under the DSE Fishways program.

Target: Provide distributional information to the state Fishway program coordinator within the first year after publication of this Action Statement to ensure that the migrational requirements for Silver Perch are taken into consideration.

Responsibility: DSE (Water Sector Group)

7. Encourage the protection and rehabilitation of riparian zones in areas where significant populations of Silver Perch occur.

Target: Liaise with relevant Catchment Management Authorities to facilitate the prioritisation of rehabilitation works (timing to coincide with Action 2)

Responsibility: DSE (Regions), Catchment Management Authorities

8. Develop a priority list of dams for remediation works to reduce the impact of cold water pollution on significant Silver Perch populations.

Target: Develop list within first year of Action Statement publication and liaise with relevant water authorities to facilitate remediation works

Responsibility: DSE (Biodiversity & Ecosystem Services Division, Water Sector Group), water authorities

Objective 4 Ensure the provision of suitable water quality and quantity (supplied at appropriate times of the year) to sites supporting significant populations of Silver Perch.

9. Implement recommendations identified in existing flow management plans and ensure that those in development/planning phase incorporate consideration of needs for species such as Silver Perch.

Target: Liaise with all relevant Water Authorities within the first year of publication to establish appropriate lines of communication and

thereafter on an annual basis or earlier if relevant streamflow management plans are being prepared.

Responsibility: DSE (Biodiversity & Ecosystem Services Division, Water Sector Group), Catchment Management Authorities, water authorities

Objective 5 Investigate the use of re-introductions of Silver Perch to improve the status of the species, and initiate at least two re-introductions into appropriate sites within Victorian waters.

10. Assess feasibility of reintroduction within its natural range and, if feasible, develop a re-introduction plan for Silver Perch. Issues to be addressed include site selection, numbers to be re-introduced, genetic considerations, threat management and monitoring.

Target: Develop a reintroduction plan within 3 years of publication of this Action Statement

Responsibility: DSE (Biodiversity & Ecosystem Services Division)

11. Based on the reintroduction plan, undertake at least two re-introductions in impoundments and riverine sites, in consultation with Fisheries Division of the Department of Primary Industries and peak angling groups.

Target: Reintroduce Silver Perch at 2 appropriate sites within 5 years of publication of this action statement

Responsibility: DSE (Biodiversity & Ecosystem Services Division), DPI (Fisheries)

Objective 6 Improve knowledge of the biology of Silver Perch.

12. Undertake and/or facilitate research in regard to:

    - The tolerance of Silver Perch to suspended and deposited sediment levels.
    - The use of floodplain habitats by adult, juvenile and larval Silver Perch.
    - The structural habitat requirements of Silver Perch.
    - The sublethel effects of high salinities on Silver Perch, including the effects on physiological processes, growth, behaviour, reproductive success and long term survival for the range of different life stages.
    - The effect of alterations in flow regimes to Silver Perch movement patterns, as well as reproductive success (survival of eggs, larvae and juveniles).
    - The impact of introduced fish species, particularly Carp and Redfin, on Silver Perch.
    - The movement patterns of Silver Perch including adults, juveniles, larvae and eggs, as well as the ability of migrating Silver Perch to negotiate barriers and utilise fishways.

Target: Develop a research plan to address the research points above within 2 years and commence research actions within 5 years of publication of this action statement

Responsibility: DSE (Biodiversity & Ecosystem Services Division)

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Further information can be obtained from Department of Sustainability and Environment Customer Service Centre on 136 186.

Flora and Fauna Guarantee Action Statements are available from the Department of Sustainability and Environment website: http://www.dse.vic.gov.au

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