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TAYSIDE BIODIVERSITY PARTNERSHIP

BADGER ACTION PLAN

Common Name Eurasian Badger

Scientific Name *Meles meles*

SPECIES PROFILE

UK Biodiversity Status	Not listed
Tayside Status	Species of Conservation Concern
Statutory Protection	Badgers are fully protected by law - The Protection of Badgers Act 1992 and The Wildlife and Countryside Act 1981
Scottish Lead Partner	Scottish Badgers

Relevant Habitat Actions Plans The badger is a "mosaic" species and occurs in varying habitat throughout Tayside. Although the majority of known sites are in woodland, there are records of setts in montane habitat and at least one open-aspect sett in a pasture. It should be noted that many setts are in semi-natural woodland, but others occur in non-native pinewoods.

DESCRIPTION AND HABITAT

- The badger is our largest surviving carnivore although it is omnivorous in habit.
- The species is largely nocturnal
- Life expectancy is 10 years
- Badgers weigh about 10kgs and are about 1 metre in length. They have a distinctive black and white face.
- Badgers live in a tunnel and chamber system called a sett
- A badger family is called a "Clan"
- Badgers require a suitable strata in which to dig their sett and a reliable food source
- Badgers are very territorial and defend areas rigorously from other clans
- Territories within Tayside are very varied ranging between Montaine and lowland woods and grasslands
- Mating takes place in late summer/early autumn
- Cubs are born the following February/March
- The staples of the badger diet are earthworms but they also eat insects, cereals, mammals, fruit, eggs and birds, green plants as well as a few other foods.
- Badgers are contractionist by nature and do not readily expand their territory.

CURRENT STATUS AND EXTENT

There are some 20 - 25, 000 badgers in Scotland, ranging in various density from the north coast to the border with England. Only the island of Arran has been identified as having badgers, which were introduced in Victorian times for sporting purposes. There is some evidence that badgers are on Skye, although this has yet to be confirmed.

In the past, badgers were found throughout Tayside in much higher numbers, but past persecutions and changes in farming methods have caused numbers to dramatically drop. Too little is known of the local population to confirm the extent of badger population.

CURRENT FACTORS CAUSING LOSS OR DECLINE

The single most important factor causing loss or decline are road traffic accidents. Too little is known about distribution to come to any realistic conclusion about other threats at this time, although it is believed that criminal persecution is low.

Badgers are particularly at risk through development, forestry and agricultural operations.

OPPORTUNITIES AND CURRENT ACTION

- There is a national impetus headed by the National Federation of Badger Groups to enhance our knowledge of the badger and to identify its distribution.
- In Tayside the North Tayside Badger Group is surveying the area and recording information on distribution. Some 26 people are carrying out local surveys.

MAIN OBJECTIVES / TARGETS

Conserve the existing population

- Measurable against existing records
- Achieve, through arrangements already in place, regular visits to known sites.
- Ongoing with at least two visits per year to each known sett
- Lead partner - North Tayside Badger Group

Survey and identify new sites

- Measurable against existing records
- Survey x ten kilometre squares per annum
- Lead partner North Tayside Badger Group.
- A figure of ??? squares per annum surveyed would be realistic.

Identify and form closer links with statutory/non statutory bodies

- Improve communication between the active Badger Group and link partners.
- Link partners would include Scottish Natural Heritage, Regional and local planning departments, Forest Enterprise, Local Biological recording centres, Tayside Biodiversity Partnership, Landowners and managers.
- Lead partner North Tayside Badger Group
- Ongoing but should be in place after one year

Promotion and Awareness-raising

- Raise awareness of the species to the public, planners and developers
- Increase the North Tayside Badger Group's membership, particularly in Perthshire

REFERENCES - add

PROPOSED ACTION FOR BIODIVERSITY

	Proposal for Action – Badger	Potential deliverers		To take place by								Meets Objective No.
		Lead Partner(s)	Partners	02	03	04	05	06	07	11	16	
LBAP Ref.	**A. Policy and legislation**											
	B. Site and species safeguard/ management											
	1. Conserve the existing population with continuation of making regular visits to known sites	North Tayside Badger Group (NTBG)										
	C. Advisory											
	D. Research and monitoring											
	1. Survey and identify new sites on a regular basis (x ten kilometre squares per annum)	NTBG										
	2. Identify and form closer links with statutory/non statutory bodies	NTBG	SNH FE FC TBP Local Biological Recording Centre Landowners									
	E. Promotion and Awareness-raising											
	1. Raise awareness of the species to the public, planners and developers	NTBG										
	2. Increase the North Tayside Badger Group's membership, particularly in Perthshire	NTBG										
	F. Plan Monitoring											
	1. Monitor and regularly review this plan on an annual basis and in detail every five years	TBP										

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TAYSIDE BIODIVERSITY PARTNERSHIP

WATER VOLE ACTION PLAN

Common Name WATER VOLE

Scientific Name *Arvicola terrestris*

SPECIES PROFILE

UK Biodiversity Status:	Priority Species
Tayside Status:	Priority Species
Statutory Protection:	Special protection under schedule 5 of the Wildlife and Countryside Act 1981 making it an offence to intentionally:

- damage or destroy any place which water voles use for shelter or protection;
- disturb water voles while they are using such a place.

UK Lead Partner:	Environment Agency on behalf of the UK Water Vole Steering Group
Relevant Habitat Action Plans	Lowland Raised Bogs; Standing Open Water; Rivers and Burns; Mesotrophic Lochs; Upland Heath; together with general riparian woodland and farmland habitats

Map – *if relevant*

DESCRIPTION AND HABITAT

The water vole is the largest of the British voles, weighing between 200g-350g, with a body length of 120mm-235mm and a tail length of 40mm-145mm. The males are larger and heavier than the females.

Water voles inhabit most types of freshwater systems, including slow-flowing rivers, lochs, ponds, raised bogs, marshes and wetlands, lowland drainage ditches and headstreams up to 600m. Being predominantly herbivorous, they require an abundant source of waterside vegetation such as rushes, sedges and in particular, grasses. Food is gathered in late Autumn, stored in underground chambers and eaten during winter months when frost and snow cover the ground for long periods. During this time there is also a greater reliance on roots, rhizomes, bulbs, tree bark and invertebrates.

With a few rare exceptions, water voles are generally found within three metres of a water course, preferring areas with steep bankings where they can excavate extensive burrow systems. In large, long established populations, these systems consist of interconnecting tunnels with many entrances and bolt holes, some of which may be under water. In smaller populations, however, and where no steep banks exist, burrow entrances are kept to a minimum and are usually well concealed at water level under thick vegetation. Entrance holes are typically wider than they are high, measuring from 4cm-8cm across and often having grazed "lawns" around them.

Breeding lasts from late March to late September with females producing from two to five litters in a season, each of four to eight young. Nests consist of shredded grass and are usually situated underground, although occasionally they are woven into the base of sedges and reeds where no suitable banks exist. Young born early in the season may breed later in the year, but most reach sexual maturity the following spring. Few voles survive more than one winter. Both males and females will aggressively defend their respective breeding territories, with males holding up to 200m of bank and females up to 100m at low densities and less than half this distance at high densities. During the breeding season territories are marked by latrines. The droppings, measuring 8-12mm long, cylindrical with blunt ends, are deposited in small piles, usually on a mud bank close to the water's edge.

Water voles are active day and night, being generally diurnal where habitat permits. Where disturbance is high, or bankside vegetation is heavily grazed by livestock, the voles will be predominantly nocturnal. In these circumstances, food is gathered and taken underground to be eaten. The water vole has evolved a defence strategy of either bolting underground or diving under water, often kicking up a concealing cloud of mud to evade native predators which at one time included stoat, weasel, heron, marsh harrier, wildcat and polecat, none of which are adapted to make any serious impact upon the species. The non-native brown rat, however, is a serious predator on water voles, as is the feral American mink which is ideally suited to pursuing water voles both under water and underground.

MANAGEMENT

The following management recommendations should aim to maintain or establish optimal habitat requirements which will maintain breeding sites (core areas), afford safe areas from flooding and maintain a corridor with sufficient vegetation to maintain connectivity between any adjacent core areas, unless isolation is considered essential to protect from mink predation.

- Retain waterside vegetation to a minimum width of 3 metres from the water's edge.
- Leave a buffer zone where fertilisers, herbicides, and rodenticides are not to be used.
- Periodic long-term mink control.
- Avoid dredging and bank alterations which are considered detrimental to water vole habitat. Where such dredging is unavoidable, ensure work does not affect both banksides simultaneously. Seek to establish steep banks of around 35 degrees. Where long stretches of low banks exist, consider using spoil to heighten banks at 30m intervals to enhance breeding habitat and reduce vulnerability of voles to flooding.
- Consider dredging or periodic grazing where habitat has decreased in quality due to siltation and scrub encroachment.
- Avoid tree planting schemes which would cause over shading to core breeding sites and fragment populations.

CURRENT STATUS AND EXTENT

Local

Although water voles are under recorded in Tayside, a few records exist to show a past widespread distribution ranging from Lowland Perthshire and Angus to high altitude catchment areas, such as Ben Lawers and Glen Lyon. Recent surveys on some of these sites, together with others resulting from local questionnaires, have concluded that water voles are now locally extinct throughout most of their former range. Such extinction of water vole populations throughout many lowland areas is now well documented. However, it is unclear just what change there has been in populations in upland areas as these have been largely neglected by researchers with just a handful of records for the whole of upland Tayside over the past twenty years.

Nationally

Although once common along water courses, ponds and wetlands throughout Britain, the water vole has suffered one of the most catastrophic declines of any British mammal this century. National surveys were carried out in 1989-1990 and again in 1996-97. The first survey found water voles present in 15-74% of the sites surveyed, while the second found only 2-30% of sites occupied with a staggering loss of an estimated 88% of the population over seven years and a loss of 94% predicted by 2002. Further accelerated declines were predicted as populations continue to fragment and constrict.

CURRENT FACTORS CAUSING LOSS OR DECLINE

- Watercourse dredging and canalisation, especially where both banksides are affected simultaneously, leading to loss of burrow systems, habitat loss and fragmentation of breeding populations.

- Overgrazing, resulting in poaching of watercourse banks, loss of waterside vegetation.

- Mink predation may now be the critical factor determining the future survival of water voles in Britain. Numerous studies have shown a direct correlation between the extinctions of water vole colonies and presence of mink. Extensive studies in England have found that even thriving water vole colonies became extinct within twelve months of mink colonising their stretch of watercourse. Studies of water vole colonies in lowland Perthshire and Angus found each became extinct within six months of mink colonising their stretch of watercourse, with one colony lasting less than one month. The relative isolation of these colonies limited their potential for recruitment from other breeding colonies and contributed to their vulnerability to extinction.

  Questionnaire results from upland gamekeepers, stalkers and water bailiffs on mink distribution found a perception that mink are expanding their range in upland areas. Suggested reasons for this include diminishing riparian prey species in lowland areas such as water vole and moorhen, together with a general warming of climate allowing rabbits to colonise higher altitudes, thus facilitating mink colonisation of upland areas, as well as elevating stoat numbers.

  However localised or widespread this may be, it nevertheless has potentially serious consequences for those small isolated water vole colonies which may still exist in upland areas.

- Pollution of watercourses from rodenticides and herbicides, sewage and nutrient run off.

- Loss of habitat due to development, inappropriate riparian management schemes such as bank improvements or tree planting resulting in overshading of core breeding sites.

- Climate change, resulting in increased flooding of water courses.

OPPORTUNITIES AND CURRENT ACTION

Although much has been done to arrest the decline of water voles in England and Wales, little has been done in Scotland outside a few key sites in Aberdeenshire, Central and Lowland Scotland. Tayside in particular has seen very little direct action on water vole conservation.

Tayside holds a wide range of conservation based organisations which collectively have the potential to utilise a large volunteer input in surveys and other conservation measures. There is also the potential to incorporate water vole conservation measures in conjunction with other Habitat Action Plans and Species Action Plans, as well as projects such as the Forest of Clunie Moorland Management Scheme and catchment projects. A handbook on 'Water Vole Habitat Management in Conservation' is available, together with a guidance booklet for planners and developers by English Nature and the Environment Agency.

MAIN OBJECTIVES / TARGETS

1. **Main Objectives**
   - Restore water voles to their former widespread distribution throughout Tayside.

2. **Main Targets**
   - Ensure no net loss of the species during the lifetime of this plan.

3. **Work Objectives**
   - Promote appropriate management of water courses and wetland habitats where water voles either currently exist or may do so in the future.
   - Carry out systematic surveys to determine the current status of water voles in Tayside. Based on the results of the survey, produce a definitive map of distribution.

4. **Work Targets**
   - Complete mapping and survey work by end of 2003 – *effective immediately.*
   - Promote management for water vole in all relevant Habitat Action Plans and catchment projects by 2003.
   - Ensure all known water vole populations are under appropriate management by 2004.

REFERENCES

- Strachan, R., and Jefferies, D.J. 1993. *The Water Vole (Arvicola terrestris) in Britain 1989-1990 : Its' distribution and changing status.* Vincent Wildlife Trust, London.
- English Nature. 1999. *Water Vole Guidance for Planners and Developers.* English Nature.
- UK Biodiversity Steering Group. 1995. *Water Vole in Biodiversity: The UK Steering Group Report.* Volume 2: Action Plans. HMSO, London.

PROPOSED ACTION FOR BIODIVERSITY

		Proposal for Action – Water Vole	Potential deliverers		To take place by								Meets Obj. No.
			Lead Partner(s)	Partners	02	03	04	05	06	07	11	16	
LBAP Ref.	A	**Policy and legislation**											
	1	Promote relative options for water voles for all relevant HAPs and agri-environment schemes.	SNH	SAC FWAG TBP	#	#	#	#	#	#	#	#	1, 3
	2	Enforce Schedule 5 (Sect 9) of the Wildlife and Countryside Act 1981 to protect the water vole's places of shelter or protection.	SNH Police Wildlife Liaison Officers			#	#	#	#	#	#	#	2,3
	B	**Site and species safeguard and management**											
	1	Advise relevant landowners of all known water vole sites with view to securing management agreements. Ensure water voles are included in management plans for relevant nature reserves and SSSI.	SEPA SNH	SWT Scottish Nature SAC FWAG	#	#	#						3

	2	Carry out mink control at regular intervals at all confirmed water vole sites and examine the possibility of larger eradication projects in key areas which could combine with other conservation interests such as fisheries, otters, black grouse and wildfowl.	SNH	NFUS SLF Landowners/ farmers	#	#	#	#	#	#	#	#	2,3
	3	Avoid the use of herbicides and rodenticides near potential water vole habitats.	SEPA	FWAG SAC Landowners/ farmers		#	#	#	#	#	#	#	3
	4	Identify any island or large viable populations where resources can be focused to ensure long-term survival.	SNH	Scottish Nature SWT	#	#							2,3
	5	Identify remnant populations considered too vulnerable for effective protection and consider translocations to suitable sites or for use in captive breeding programmes.	SNH	Scottish Nature SWT			#	#	#				1
	6	Identify sites suitable for re-introductions in conjunction with appropriate site management, with due consideration given to the biological differences of high altitude and lowland populations.	SNH SWT Scottish Nature	SAC FWAG				#					1
	C	Advisory											
	1	Provide advice to riparian landowners and other relevant parties on water vole habitat management and the reasons for and methods of mink control.	SAC FWAG SNH	SEERAD NFUS SLF			#						4
	2	Consider production of a management booklet for distribution.	SNH SWT	FWAG SAC		#	#	#	#	#	#	#	1
	D	Research and monitoring											
	1	Carry out systematic survey to produce a definitive map of water vole distribution in Tayside and make available to relevant bodies.	SNH	SWT Scottish Nature RSPB	#	#	#						3,4
	2	Identify key upland areas where a population metadynamic study may increase understanding of upland water vole ecology.	SNH				#						3
	E	Promotion and awareness-raising											
	1	Organise occasional seminars for interest groups and landowners on the plight of water voles and their needs, possibly widening the theme to riparian management to include otters	SNH SWT FWAG SAC SEPA			#			#				1
	2	Plan a publicity programme for schools and colleges to raise awareness and encourage more distribution records.	SNH SWT	PKC DCC AC TBP		#	#	#	#	#	#	#	1
	F	Plan Monitoring											
	1	Monitor and regularly review this plan on an annual basis and in detail every five years	TBP					#					All

TAYSIDE BIODIVERSITY PARTNERSHIP

GREY PARTRIDGE ACTION PLAN

Common Name *Grey partridge*

Scientific Name *Perdix perdix*

SPECIES PROFILE

- **UK Biodiversity Status** — Priority Species
- **Tayside Status** — Priority species
- **Statutory Protection** — Gamebirds - protected by close seasons – 1 February to 31 August.
  The Grey partridge is also listed on Annex III/1 of the EC Birds Directive and Appendix III of the Bern Convention.
- **UK Lead Partner** — The Game Conservancy Trust
- **Relevant Habitat Actions Plans** — *Cereal Field Margins; Hedgerows and Treelines*

Key sites -

DESCRIPTION AND HABITAT

A medium sized bird up to 31cm long, grey/brown with a distinctive orange face, speckled upperparts and less bold flank stripes.

The Grey partridge originated as a grassland bird on the open, largely treeless, Steppe; this has allowed it to adapt easily to cereal farmland.

- Nests on the ground, hidden in rough grass or similar vegetation. After the eggs hatch the cock and hen take their brood to forage among tall grasses or cereals for caterpillars, beetles, plant bugs and aphids.
- As they mature, chicks begin to feed, like their parents, on young shoots and seeds.
- Tall tussocky vegetation at the base of a hedgerow makes an ideal nest site. Cereal crops provide good cover from predators while the young brood is searching for insects.

MANAGEMENT

The ideal habitat of the Grey partridge is open arable farmland, especially on lighter soils and ideally with no more than 10 trees per km. in hedgerows. Undisturbed dry nest sites in hedge bottoms and banks with tussocky grass are usually utilised. The chicks need a variety of insects in their first weeks and a Wild Headland with its zero use of herbicides and fertilisers is ideal. Weedy stubbles, field margins and banks provide shelter and food over the winter.

Small populations of 'hill grey partridges' are found on many moorland fringes. These benefit from the control of predators as their nesting habitat tends to be linear and easy for predators to work. Grey partridge chicks are often supported by sawfly larvae found on dwarf rushes associated with the upland edge.

CURRENT STATUS AND EXTENT

- The UK population of Grey partridge declined by 82% between 1969-1990 to a current estimated 150,000 pairs. Populations in some mixed farming areas seem quite stable, especially in the north, but in areas of historical low abundance such as intensive grasslands in the west, declines have sometimes exceeded 95%.
- The Grey partridge has a wide distribution across much of Tayside, especially in mixed arable areas. It favours farms still growing forage root crops and raspberries.
- Many 'hill partridge' populations have not shown the same declines demonstrated by the lowland/arable populations.

CURRENT FACTORS CAUSING LOSS OR DECLINE

- Loss of nest sites (such as hedge bottoms and other field margins) due to farm intensification. The ITE has estimated a 20% loss of hedgerows between 1984 and 1990.
- Reduced food supplies and sources for chick food through the use of insecticides and herbicides.
- Loss of winter stubble and forage crops such as turnips for over-wintering birds may have an effect.
- Vulnerability of nests to predators in farmland accompanied by a decline in professional keepers devoting time to predation control.
- Nest destruction caused by early mowing of silage as opposed to hay and other farm operations.

OPPORTUNITIES AND CURRENT ACTION

- The agri-environment Rural Stewardship Scheme (and agreements made on the previous Countryside Premium Scheme) provides grant aid for farmers. A range of options under the schemes (i.e. unharvested crops, grass margins, hedge planting, conservation headlands) has the potential to benefit Grey partridge.
- The GCT, SAC and FWAG actively promote RSS throughout Tayside.
- In conjunction with Advisory Client and LEAF farmer Edward Baxter in Fife, a working demonstration farm has been set-up where monitoring and experiments have been conducted by the GCT Lowland Research Teams.
- An SBAP Species Recording Chart has been produced and circulated for the Grey partridge by The Game Conservancy Trust.
- GCL run courses in game conservation, several of which focus heavily/exclusively on Grey partridge management.
- Game Conservancy Limited Advisory Services provide specialist professional advice on habitat enhancement, help from grant aid, predation control requirements, counting in spring and autumn, and optimum harvesting strategies for Grey partridge.
- The Rural Stewardship Scheme has potential to benefit the species and provide the best publicly-funded mechanism currently available to help reach the targets set. There are also opportunities to enhance Grey partridge habitat through the set-aside Wild Bird Cover Option, Grass Option and Natural Regeneration Options.
- Grant aiding the employment of professional gamekeepers/countryside wardens could reverse the difficulties caused by declining predation control at key nesting and chick raising periods.
- Set-aside land currently offers important habitat creation opportunities for this species. Partridge-friendly prescriptions should be rewarded at higher levels to reflect their increased management costs.

The UK Lead Partner's Role (Game Conservancy Trust)

- The Grey partridge has been listed as a costed, key species in the UK Steering Group Report.
- The Game Conservancy Trust is the lead organisation for this species in the UK.
- The Game Conservancy Trust encourages land managers to create suitable conditions for this species. Conservation Headlands, unharvested crops, beetle bank, well distributed forage crops and winter stubbles are key to this advice, along with predation control and sustainable shooting controls.

MAIN OBJECTIVES / TARGETS

1. Despite still being numerous and widespread, the Grey partridge has declined dramatically on farmland in the UK in the past hundred years. Without action this species could repeat the trends demonstrated by the corncrake, declining throughout its range and becoming threatened due to agricultural intensification. Many of the reasons for decline are well known and have been the subject of intensive study by the GCT. The Grey partridge will respond quickly to favourable management and the Action Plan aims to restore a proportion of the population to its previous level.
2. Halt the decline by 2005.
3. Contribute towards improving the UK population to above 150,000 pairs by 2010.
4. Maintain, and where possible enhance the current range of this species.
5. Tayside is a region where the Grey partridge was particularly abundant, so there is great scope to re-build populations by sympathetic land management and effective predation control in the most vulnerable spring/early summer breeding season.

GLOSSARY OF TERMS/ ABBREVIATIONS:

GCT	The Game Conservancy Trust
GCL	Game Conservancy Limited Advisory Services
SEERAD	Scottish Executive Environment & Rural Affairs Department
SAC	Scottish Agricultural Colleges
FWAG	Farming & Wildlife Advisory Group
LEAF	Link Environment & Farming

REFERENCES:

1. **Potts, GR** (1986) *The Partridge, Pesticides, Predation and Conservation*. Collins, London.
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PROPOSED ACTION FOR BIODIVERSITY

	Proposal for Action – Grey Partridge	Potential deliverers		To take place by								Meets Objective No.
		Lead Partner(s)	Partners	02	03	04	05	06	07	11	16	
LBAP Ref.	**A. Policy and legislation**											
	1. The species is protected by close seasons – 1 February to 31 August	GCT										
	2. The species is listed on Annex III/I of the EC Birds Directive and Appendix III of the Bern Convention.											
	B. Site and species safeguard/ management											
	1. Encourage landowners and managers to create suitable conditions for the species, including conservation headlands, unharvested crops, beetle banks, well distributed forage crops and winter stubbles.	GCT	SAC FWAG NFUS SLF									
	C. Advisory											
	1. Promote the RSS to landowners and managers.	GCT SAC FWAG										
	2. Provide specialist professional advice on habitat enhancement.	GCT	SAC FWAG									
	3. Promote the LEAF demonstration farm in Fife and consider any opportunities to set up a similar demonstration site in Tayside.	CGT LEAF	SAC FWAG									
	D. Research and monitoring											
	1. Continue circulating SBAP Species Recording Charts to assess distribution of the species throughout Tayside	GCT										
	E. Promotion and awareness-raising											
	1. Run a series of courses in game conservation, focussing extensively on grey partridge management.	GCT										
	F. Plan Monitoring											
	1. Review plan on an annual basis and in detail every five years	TBP										

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TAYSIDE BIODIVERSITY PARTNERSHIP

SWIFT
ACTION PLAN

Common Name *Swift*

Scientific Name *Apus apus*

SPECIES PROFILE

- UK Biodiversity Status
- Tayside Status
- Statutory Protection — Wildlife & Countryside Act 1981. It is illegal to *intentionally* destroy or disturb the nest site during the nesting season.
- UK Lead Partner (if any) — Concern for Swifts and Concern for Swifts (Scotland)

Relevant Habitat Actions Plans — Urban and Built Environment, Businesses with Land,

Map

Distribution – Widely distributed throughtout Tayside.

Loch of Kinnordy (RSPB Reserve) – noted feeding area;
Caltto Reservoir attracts swifts during migration.

DESCRIPTION AND HABITAT

Swifts are sometimes confused with the other hirundines: house martins and swallows. Distinguishing characteristics are: lack of white on the body; the fact that they do not land anywhere; invisibility of the nest (as it is within the fabric of a building).

- Swifts are small (wing-span of approx. 16") boomerang-shaped birds which look all black against the sky (the small white area on the throat is not often visible)
- They are summer migrants to Britain, arriving in Scotland from Africa at the beginning of May and leaving in early August.
- They have become finely adapted to live entirely on the wing and only set foot to ground at the nest site. The nest is minimal – small air-borne particles glued together with saliva to form a small saucer.
- They feed on large quantities of insects and aerial plankton. When feeding young these are collected in a gape below the beak and fed to the nestlings in a ball.
- Because they feed only on the wing they are very dependant on weather conditions and because of this, they are unique in the ability of the young to go into a state of torpor and survive for several days without food.
- On fine summer evenings local swifts will gather together in wild "screaming parties", chasing around the buildings where they nest. It has been claimed that they reach speeds of up to 200km/hr.

HABITAT

Swifts feed anywhere where there may be aggregations of air-borne insects. The significant habitat as far as swift conservation in Britain is concerned is the nest site habitat. Swifts have adapted to nesting almost exclusively in buildings. They have been recorded nesting in church towers; under roof tiles; on the wall head of buildings (gaining access via gaps and cracks in the wall or soffit); and in holes in the walls of buildings. Although usually associated with older buildings, they will also be found nesting in recent buildings so long as there are suitable gaps and spaces. They need a clear flight path to and from the nest, which is usually over 4m above ground.

Young pairs seek out new or unoccupied nest sites during their first summer as adults and return to breed there in the following year. Pairs are loyal to their nest sites and if disturbed or excluded from a nest site may find it difficult to relocate to a new nest site at least for that season. This why the conservation of existing sites is important.

Nesting does no damage to buildings nor do swifts leave mess around the nest site. They are able to gain access through holes which are too small for starlings or pigeons.

CURRENT STATUS AND EXTENT

The most recent BTO estimate for the total swift population in Britain is about 80,000 pairs. The common swift nests in most areas of Britain except the windswept western islands, but an increasing number of people both in Britain and abroad are becoming concerned about a decline in numbers generally associated with renovation or demolition of buildings. There are many places where swifts used to breed but are now absent.

The focus on swift nest site conservation is international and accelerating. Such a focus is also reflected in concerns and projects across Europe and the Middle East. Although some people are pressing for the swift to be included on the RSPB's "orange" list, lack of repeat survey data makes it impossible to ascertain the exact status of the decline.

Tayside status

At present Tayside appears to hold a healthy population of swifts. However, there are increasing reports of loss or diminution of colonies. Main feeding areas and gathering areas are noted at (insert information when available).

In Tayside, nesting swifts are reported to be mainly in older buildings, often at eaves level. Important feeding areas are (insert information).

There has been no integrated survey in Tayside, although some figures have been collected by SOC, Concern for Swifts (Scotland) and more recently by voluntary groups such as the Broughty Ferry Environment Project and Dundee Ranger Service.

CURRENT FACTORS CAUSING LOSS OR DECLINE

The impact of various changes to the insect population on swifts is unknown (drought in their winter home grounds, insecticide use in agriculture etc.). There is, however, a connection between loss of nest sites and loss of breeding colonies and an important focus of concern for our swift populations is loss of nest sites due to modern building practices.

Increasingly swifts are excluded from their traditional sites by construction details, materials and repairs which seal all gaps and cover ventilation spaces. Wire mesh plates or grids are now used to cover ventilation gaps and new building materials and techniques do not offer alternative possibilities.

OPPORTUNITIES AND CURRENT ACTION

- Swift nest site conservation is taken very seriously in Amsterdam where thousands of nest sites have been built into renovated or new buildings. There are also examples of work from Berlin.
- There are several projects in England involving protection and creation of nest sites.
- In Scotland both Glasgow and North Lanarkshire Housing Departments have agreed to make provision for swifts in their repair and renovation programmes.
- Several Housing Associations and Co-ops have agreed to make swift nest site provision in new housing schemes.
- Both Historic Scotland and the National Trust for Scotland support the airms and objectives of this Action Plan. In Tayside, for example, gaps in stonework at eaves level were retained for swift access and a case study involving the renovation of Stanley Mills, Perthshire, was featured in the Built and Developed Environment HAP.
- Information is becoming increasingly available about conserving existing swift nestsites and creating new ones.

OBJECTIVES

The objective of the Action Plan is to ensure provision is made for swifts in new buildings and during renovation to older buildings in and adjacent to areas where there are known or suspected to be swifts colonies. Thus it will be possible to ensure an increase in suitable nesting habitat for swifts in those areas.

In principle this is not a dificult task because permitting swifts access to potential nest sites has been found to be acceptable, cheap and technically easy. Swifts seem to prefer a small entrance giving access to a larger internal space for nesting. The small entrance generally excludes sparrows, starlings and pigeons. However, achieving action requires continued vigilance and liason with house owners, local authority personnel, NGOs, builders and developers.

Insert local case studies

REFERENCES

- Lack.D. Swifts in a tower. 1979
- Scottish Executive Development Department, 2000. *Planning for Natural Heritage PAN 60.*
- Scottish Office Development Department, 1999. *NPPG 14 Natural Heritage.*
- SOC

PROPOSED ACTION FOR BIODIVERSITY

	Proposal for Action – Swift	Potential deliverers		To take place by								Meets Obj. No.
		Lead Partner(s)	Partners	02	03	04	05	06	07	11	16	
LBAP Ref.	**A. Policy and legislation**											
	1. Enforce Wildlife and Countryside Act 1981.											
	2. Liaise with council departments to ensure that local authorities take the lead in swift nest site conservation in their own properties by retaining existing nest sites or making new provision.	Concern for Swifts (Scotland) PKC AC DCC										
	3. Have swift conservation measures included in planning conditions for new build or change of use proposals in relevant areas.	CfSS PKC AC DCC	SNH									
	4. Promote the practice that building repair work or demolition should not begin between mid-May and the end of July where swift nest sites are believed to exist.	TBP CfSS SNH	Architects Developers PKC AC DCC									
	5. Liase with local authority historic building conservation sections to require conservation of swift nest sites when considering grant aid for the repair or renovation of historic buildings. Involve Historic Scotland, National Trust or the Scottish Executive as appropriate.	CfSS SNH	PKC AC DCC HS NTS SE									
	B. Site and species safeguard/ management											
	1. Achieve 6 pilot projects in both renovated buildings and new buildingsacross Tayside	TBP BFEP DCC	PKC AC NTS HS									
	2. Inform owners/ occupiers of properties with breeding swifts of the birds' presence, of their legal obligations and of the positive conservation action they can undertake.	CfSS TBP										
	3. Incorporate the results of the Swift Survey into local authority planning GIS systems so that up to date information on swift nesting areas and significant buildings is readily available.	PKC AC DCC TBP	Local Biological Records Centre									
	C. Advisory											
	1. Offer advice on suitable design details for swift nest sites.	TBP CfSS										
	2. (i)Promote the use of externally-fitted nest boxes only where it is not possible to use existing internal spaces. (ii) Circulate the "Swifts in Historic Buildings" Advice Note where	TBP CfSS	NTS HS									

	appropriate to local authorities, NGOs, architects and developers.											
	3. Promote the use of external nest boxes as a tool for education and awareness e.g. on schools and in Country Parks.	TBP CfSS	PKC DCC AC									
	D. Research and monitoring											
	1. Co-ordinate records of swift nest areas or sites in order to update and maintain the GIS map	SOC	Local Biological Records Centre									
	2. Publicise swift survey requirements and enlist the help of interested individuals and organisations.	TBP CfSS	PKC, DCC, AC, NTS, HS, SOC, BTO, RSPB									
	3. Co-ordinate a comprehensive survey of swift colonies in Tayside as an indication of where nest conservation is needed and as a base line for future surveys	SOC TBP	CfSS									
	4. Continue to monitor numbers of feeding swifts over key sites	SOC										
	5. Keep records of the buildings swifts nest in and where in the buildings they nest in order to structure swift nest site conservation to various situations	PKC DCC AC	NTS HS TBP									
	6. Monitor and analyse population fluctuations across Tayside	SOC										
	E. Promotion and awareness-raising											
	1. Distribute appropriate leaflets to architects, developers, planners and the public in general to raise awareness of the species (e.g. Concern for Swifts (Scotland) and Swifts in Historic Buildings.)	CfSS TBP										
	2. Encourage involvement of schools and community groups in areas where there are swift colonies.	PKC, DCC, AC, BFEP, TBP										
	3. Input relevant information to web-site so that information can be shared.	CfSS TBP										
	4. Ensure that the media is aware of swift conservation issues and swift nestsite requirements, highlighting at the same time suitable 'best practice' case studies from both the public and private sector	CfSS TBP	HS NTS RSPB PKC DCC AC									
	F. Plan Monitoring											
	1. Monitor and review this plan on an annual basis and in detail every five years	TBP										

CONSULTATION DRAFT: 2ND TRANCHE – SAP/F1

full colour transparency available √

TAYSIDE BIODIVERSITY PARTNERSHIP

ATLANTIC SALMON ACTION PLAN

Common Name Atlantic Salmon

Scientific Name *Salmo salar*

SPECIES PROFILE

UK Biodiversity Status:	Species of Conservation Concern
Tayside Status:	Species of Conservation Concern
Statutory Protection:	The Salmon and Freshwater Fisheries Protection (Scotland) Act 1951; Salmon Fisheries (Scotland) Act 1868; Freshwater Salmon Fisheries (Scotland) Act 1976; The Salmon (Scotland) Act 1986; Salmon (Fish Passed and Screens) (Scotland) Regulations 1994.
UK Lead Partner:	
Relevant Habitat Action Plans	Rivers and Burns; Standing Open Waters; Mesotrophic Lochs; Estuaries

Map

DESCRIPTION AND HABITAT

Salmon spawn in the late autumn / winter in clean gravelly rivers and streams. The female salmon digs a hole in gravel with her tail and deposits her eggs which are then fertilised by the male. The female fish covers the fertilised eggs with more gravel. The numbers of eggs produced vary according to the size of the fish and other factors, but average approximately 1500 per kg of fish weight.. The eggs incubate over a period of months depending on water temperature. Water currents percolating through the gravel bring dissolved oxygen to the eggs and carry away ammonia and other metabolic products.

In the late spring having absorbed their yolk reserves the fry wriggle out of the gravel and commence feeding. The little fish occupy a position on or near the river bed by swimming into the current; they intercept invertebrates which drift or swim past them in the current. From the start, the fry are fiercely competitive and establish territories. As they grow they become known as parr. They seem to prefer fairly fast cobbly, even bouldery, streams 10cm to 40cm deep where they use the stones along the river margins as shelter from the current and from seeing each other. This habitat segregation results from competition with the older parr. With the onset of winter and the cooling of the water, their metabolism slows down and they then spend extended periods hiding in the substrate.

After a period of some years in the Spring a parr will develop a silver coat and now known as a smolt migrates to the sea. The age at smolting depends on the fish's growth rate which can be influenced by stream fertility, level of competition and temperatures. In this part of the world most smolts are two years old, but in low fertility headwaters the majority may not smolt until three years. In some low lying rich burns such as the Cruick Water on the North Esk or the Dean Water in Strathmore some smolts might actually only be one year old.

Once in the sea our understanding of their life history is patchy. The smolts seem to migrate quickly out of the coastal zone and head north towards the Norwegian Sea or the Faroe Islands. Some migrate westwards rounding Cape Farewell to the west coast of Greenland. At sea the fish grow rapidly as salmon seem to be voracious and generalist feeders, eating crustaceans and small fish such as sandeels, capelin, blue whiting, herring, etc. After a year at sea they may weigh 1.5k, increasing to 3k or 4k by eighteen months. Sexual maturation starts after a period of this rich feeding and the fish make their way homewards again.

The timing of the onset of maturation again varies. Some fish mature in their second summer at sea and return to spawn in their second winter after smolting. By convention these fish are known as "one sea-winter fish" or commonly as "grilse". Some fish will not mature for a further year, "two sea-winter" fish, with some even staying out for one or two further years. In addition to a varied age at maturation, the actual calendar date of return into freshwater is also variable. Some grilse start to appear in freshwater as early as May and will not spawn until November while other grilse return as late as December and spawn within days. These differences in maturation rates and time of return may be influenced by environmental conditions, but it is also accepted that there is a strong genetic component to it.

It is well known that Salmon have the ability to return to their native rivers. In fact they will even return to their natal stream or even part of the stream. Within a river system this homing allows sub-populations of salmon to exist giving rise to a diversity of traits, arising in part to adaptation to local conditions. Thus the fish which tend to spawn in the upper reaches of rivers (e.g. the upper main stem of the North Esk, the Blackwater / Shee, the Tilt, the Lyon or the Dochart on the Tay) tend to enter freshwater early in the calendar year while fish which spawn in the lowland reaches tend not to enter until the autumn.

Thus a main issue in salmon conservation is maintaining the diversity of types and the integrity of individual sub-populations.

CURRENT STATUS AND EXTENT

Tayside is one of the most important regions for Atlantic salmon in the UK. The main populations in rank of relative importance are in the River Tay system, North Esk, South Esk and the Earn. Smaller, but none the less important populations occur in the Lunan Water and the Dighty Burn.

Current Status of Stocks

Assessment of the size of salmon populations is usually inferred from fishing catches, which although a useful guide do not necessarily reflect true changes in population size. The trends in catches in net fisheries and many rod fisheries has been downwards since the 1960s. Most noticeable has been the decline in numbers of two and three sea-winter salmon entering early in the year. In the 1950s perhaps 1000 fish might be caught on the Tay between the opening of the angling season on 15 January and 1 March, whereas it is now a small fraction of this. Over the longer term however, fish entering the Tay and the Esks in the late autumn have actually increased.

To improve the accuracy of salmon numbers in Tayside electronic counts have been undertaken on the North Esk (since 1981) and on the Tay tributaries Tummel (since 1953) and Ericht (since 1990). The numbers ascending the North Esk show a slight increasing trend since the 1980s as does the Ericht since 1990. The longer series for the Tummel at Pitlochry has been fairly stable over the long term except for a period of greater abundance in the 1970s. Another counter at Clunie Dam on the Tummel system actually shows a threefold increase in the 1990s.

The stability or slight increases in counter figures probably reflects the reduced netting effort in recent years and that fish which formerly would have been caught succeed in entering

freshwater. The numbers returning to the coast have decreased. This effect has probably been quite marked in Tayside owing to the historic intensity of net fishing locally. In the early 1980s the then Department of Agriculture and Fisheries for Scotland estimated fixed sea nets in general on the east coast of Scotland took around 50% of fish on the coast in summer. However, on the North Esk, the various nets combined might take up to 80% of incoming fish, probably the highest level of exploitation of any river in Scotland.

The decline in returns to the coast seem largely to be caused by an increase in mortality at sea. Since the mid-1960s smolt tagging investigations on the North Esk indicate output from that river has shown no trend over this period but survival rates back to the coast seem to have fallen from perhaps 40 - 50% to nearer 10%. Census of juvenile salmon by electrofishing in parts of the Tay system still indicate good numbers of juveniles. In the upper reaches of the Tummel system juvenile numbers have increased in the last decade. This followed what were thought to be improvements in fish access at a hydro electric facility lower downstream. Thus this salmon population has expanded as it has recolonised some of it's former range.

CURRENT FACTORS CAUSING LOSS OR DECLINE

Fisheries

Salmon have long been exploited, first as a food resource and now to an ever greater extent by recreational fishing. From Medieval times netting for salmon was important on the Tay and the Esks and until recently there still existed a considerable commercial fishery in Tayside. Only ten years ago on the Tay estuary, for example, netting was conducted from the mouth of the River Earn to the mouth of the River Almond. On the North Esk, in addition to the estuary, the lowest mile of the river was netted as was also the estuary of the South Esk. In addition a myriad of fixed nets were set in Montrose Bay, Lunan Bay and the headlands south of Montrose.

For a number of reasons including conservation buy-out schemes and commercial failure through reducing catches and reduced prices owing to salmon farming, the number of net fisheries has declined greatly during the 1990s. Since 1997, when the netting rights were leased by the Tay Foundation, there has been no appreciable netting in the Firth of Tay. Netting effort has also reduced in the Montrose area with none taking place in the Montrose Basin or within the North Esk above the head of tide; netting does still take place in the estuary and in Montrose Bay.

The angling fisheries on the Tay and the two Esks are of considerable importance, the Tay alone thought to bring in £10 to £15 million per year. Angling is regulated to prevent any possibility of over-cropping. Fishing rights are private property and so the numbers of anglers is firstly controlled. In addition statutory laws prohibit certain methods being used (e.g. use of prawns and shrimps as bait), specify fishing seasons and owners themselves often request that only certain methods are used on their waters.

Marine Mortality

The causes of the increased marine mortality in recent years are not exactly known. It is now accepted that marine climatic influences may play a large part. In recent decades there have been concurrent changes in sea temperatures, currents, plankton abundance and other fish species. There is little doubt that such events have occurred but the mechanisms are not clear. Over the long term major fluctuations in the abundance of different sea ages of salmon or calendar run timing have occurred in the past. However, it is feared that climate change may be a driver of the current decline and we may be entering a new phase.

OPPORTUNITIES AND CURRENT ACTION

- Rural Stewardship Scheme increases the awareness of the importance of riparian zones for the conservation of aquatic systems.
- Forestry restructuring and the Forest Water Guidelines.

[add others]

MAIN OBJECTIVES / TARGETS

- Maintain salmon populations above biologically safe levels.
  [add targets]
- Increase awareness and education opportunities regarding wild salmon resources and the aquatic ecosystem.
  [add targets]

GLOSSARY OF TERMS / ABBREVIATIONS: add

REFERENCES: add

PROPOSED ACTION FOR BIODIVERSITY

		Proposal for Action – Atlantic Salmon	Potential deliverers		To take place by								Meets Objective No.
			Lead Partner(s)	Partners	02	03	04	05	06	07	11	16	
LBAP Ref.	A	Policy and legislation											
	1												
	2												
	B	Site and species safeguard and management											
	1	Encourage good riparian management where appropriate											
	2	Promote appropriate habitat protection schemes											
	3	Promote appropriate habitat enhancement and restoration schemes											
	4												
	C	Advisory											
	1	Provide advice to riparian landowners, fisheries managers and other relevant parties on riparian habitat management											
	2	Incorporate appropriate biodiversity information into relevant newsletters and publications.											
	3												
	D	Research and monitoring											
	1	Encourage stakeholders to assist in data collection. 1. Undertake a juvenile survey and monitoring programme. 2. monitor annual salmon smolt production in designated Tayside rivers.											
	2	Consider a fisheries habitat survey											
	3	Monitor the implementation of this Action Plan on an annual basis and review in full every five years	TBP										
	4												
	E	Promotion and awareness-raising											
	1	Liase with stakeholders to arrange demonstration or training events to raise local awareness.											
	2												

CONSULTATION DRAFT: 2ND TRANCHE

TAYSIDE BIODIVERSITY PARTNERSHIP
(in association with the Cairngorms LBAP)

MASON BEE ACTION PLAN

Common Name *MASON BEE*

Scientific Name *Osmia inermis*, Hymenoptera: Apidae

SPECIES PROFILE

UK Biodiversity Status	UK BAP Priority Species
Tayside and Cairngorms Status	Priority species - restricted to one known modern Tayside area (Blair Atholl), although other historic ones are known and one newly discovered site in Deeside.
Statutory Protection	None. The species is listed as **Red Data Book 2**, *Vulnerable,* in Shirt, 1987 and Falk 1991.
UK Lead Partner	UK Lead Partners SNH, Aculeate Conservation Group
Relevant Habitat Actions Plans	Upland; Calcareous Grassland (including Limestone Pavements)

MAP –

List of Key Sites and Site Distribution

DESCRIPTION AND HABITAT

This bee is one of a small group of boreal/alpine species of aculeate Hymenoptera found in the United Kingdom.

All nesting sites found in Scotland have been in the altitude range 300 to 600m, although there are some earlier records from lower areas. Nests, which may be the work of several bees and exist for several generations, are built in crevices in rock, or under thin stones lying on the surface of the ground or short vegetation . All nest sites are in warm, sunny positions.

Nests are made in areas which have sufficient calcareous influence to support good numbers of its sole known UK pollen-forage plant, Common Bird's-foot Trefoil, *Lotus corniculatus.* The flight period of the bee, in Scotland, is from late April to early July. The chrysidid wasp *Chrysura hirsuta* (also a UK BAP species) known to be parasitic upon this bee and is present in the Blair Atholl area.

MANAGEMENT

Appropriate management of the calcareous grassland habitat is provided by Autumn-Winter-grazing, which subsequently encourages the growth and flowering of its pollen-forage plant, Common Bird's-foot Trefoil and a short, mixed-heather, vegetation structure. Summer grazing, especially by sheep, removes the flowering heads of the Bird's-foot Trefoil. It is essential that the habitat includes thin, loose stones lying on the surface of the vegetation or suitable cracks in rocks.

CURRENT STATUS AND EXTENT

This species is circumpolar in distribution, being found at low altitudes north of the Arctic circle and in montane locations further south. The site in Blair Atholl is the only known extant site for the species in Tayside. One other site in Braemar makes up the total, known, population in the UK.

CURRENT FACTORS CAUSING LOSS OR DECLINE

Loss of herb-rich upland grasslands or moorlands with short swards through loss of, or decline in, sheep grazing. Overgrazing by sheep and deer in the summer may, also, reduce the availability of it's forage plant, Bird's Foot Trefoil. Direct afforestation of the remaining sites is also considered a potential threat.

The species has a highly fragmented and very localised distribution in the Cairngorms, making it very vulnerable to unforeseen detrimental events and susceptible to changes in land management. By being restricted to two isolated sites, this species has little opportunity to (re)colonise new areas away from Blair Atholl and Braemar.

OPPORTUNITIES AND CURRENT ACTION

Sympathetic management of a much larger area of potentially suitable habitat in adjacent areas.

Targeted awareness raising of the species and its habitat requirements to local naturalists, landowners, farmers, crofters and conservation advisors may well reveal further locations within Tayside and the Cairngorms. The nests are very distinctive and easily identified by non-specialists.

Inclusion of the requirements of Osmia Inermis in agri-environment and forestry schemes. Farmers and crofters can score high biodiversity ranking points under the Rural Stewardship Scheme for activities benefiting this UK priority species.

Ensure the species is included in management prescriptions for all relevant SSSIs.

Consider notifying as SSSIs sites supporting viable populations of Osmia Inermis.

Information gathering for a Tayside/Cairngorms dataset

MAIN OBJECTIVES / TARGETS

National Action Plan objectives and Targets and comment on Progress

- Survey to determine the status of the bee in Tayside and the wider Cairngorm area by 2005. (Considerable survey effort on the part of ACG, but great opportunity for locally resourced survey)
- Seek to identify its precise habitat requirements by 2005. (Completed, 2001)
- Seek to identify and maintain all strong populations.
- Seek to ensure the long-term survival of the bee in Tayside and the wider Cairngorms, using habitat restoration and translocations as necessary. (Not started)

GLOSSARY OF TERMS/ ABBREVIATIONS: still to complete

REFERENCES:

- Edwards, R.(ed.), 1997. *Provisional atlas of the aculeate Hymenoptera of Britain and Ireland, part 1.* 114:115. B.R.C.
- Edwards, M., 1999. *Report of Searches for the Biodiversity Action Plan (Second List) Bees Colletes floralis and Osmia inermis in Scotland. June to July, 1998.* Scottish Natural Heritage Commissioned Report No F98AC320 (Unpublished report)
- Edwards, M. 2000. *Continued Researches into the Autecology and Distribution of the bee Osmia inermis (Zetterstedt) (Hymenoptera:Apidae) in Scotland.* Scottish Natural Heritage Commissioned Report No F99AC312 (Unpublished report)
- Edwards, M. 2001, *Survey of three Biodiversity Action Plan bee species (Colletes floralis, Osmia inermis, O. uncinata) in Scotland, 2001.* Scottish Natural Heritage, RSPB (Unpublished report)
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- Westrich, P. , 1989. *Die Wildbienen Baden Wurttembergs,* 819. Ulmer, Stuttgart

PROPOSED ACTION FOR BIODIVERSITY

	Proposal for Action – OSMIA INERMIS	Potential deliverers		To take place by								Meets Obj. No.
		Lead Partner(s)	Partners	02	03	04	05	06	07	11	16	
LBAP Ref.	**A. Policy and legislation**											
	B. Site and species safeguard/ management											
	1. Seek to identify its precise habitat requirements by 2005. (Completed, 2001)	SNH										
	2. Seek to maintain the two Tayside and Cairngorms sites by bringing them under a long-term favourable management agreement.	SNH										
	3. Seek to ensure the long-term survival of the bee in Tayside and the wider Cairngorms area, using habitat restoration and translocations as necessary	SNH										
	4. Seek to identify further sites in the Tayside/Cairngorms area	TBP CBP	SNH ACG									
	C. Advisory											
	1. Promote responsible habitat management through targeted suitable advice.	SNH FWAG SAC										
	D. Research and monitoring											
	1. Survey to determine the status of the bee by 2005.	ACG										
	E. Promotion and awareness-raising											
	1. Increase awareness of the species and its habitat by providing suitable identification materials and promoting these widely amongst interested local people.	TBP CBP	SNH ACG									
	2. Feature the species in the Perth Museum exhibition on Tayside Biodiversity Action Plan in the museum 2004	PKC	TBP									
	F. Plan Monitoring											
	1. Monitor and review this plan on an annual basis and in detail every 5 years	TBP CBP										

CONSULTATION DRAFT: 2ND TRANCHE – SAP/VP1

full colour transparency available √

TAYSIDE BIODIVERSITY PARTNERSHIP

BLUEBELL (or Wild Hyacinth) ACTION PLAN

Common Name *BLUEBELL*

Scientific Name Hyacinthoides non-scripta
(Previously Endymion non-scripta, Scilla non scripta)

SPECIES PROFILE

- **UK Biodiversity Status** — UK priority species, Long list
- **Tayside Status** — Species of Conservation Concern
- **Statutory Protection** — Bluebells have legal protection under the Wildlife and Countryside Act 1981, Schedule 13 (Section 8)
- **UK Lead Partner** — None
- **Relevant Habitat Actions Plans** — Lowland Mixed Broadleaves; Upland Oakwoods; Upland Mixed Ashwoods; Upland Birchwood; Scrub; Hedgerows and Treelines

MAP – *to show Tayside distribution*
List of Key Sites (to add)
Site Distribution – Found throughout Tayside, but usually associated with ancient or long-standing semi-natural woodlands, where they may form dense 'carpets'. They are also found in hedge bottoms, along the tops of sea-cliffs and occasionally in unproductive pastures and under bracken, which can act as a substitute woodland canopy for the plant.

DESCRIPTION AND HABITAT

Short hairless perennial with heavily scented, violet-blue drooping bell-shaped flowers. Flowers can also be pink or white.

The sap was widely used to starch cotton neck ruffs in Elizabethan times; it was also used as a glue in book-binding

- Native to North -Western Europe
- Reproduction is by vegetative means; the underground stem thickens to form a bulb, with new bulbs formed in the axils of the leaves
- Prefers slightly acidic soil
- Prefers partial shade where the light intensity does not fall below 10% of daylight between April and mid June
- Has a fairly narrow tolerance of light levels
- In favourable conditions, particularly in Beech woods, dense 'carpets' can form
- Valuable source of nectar for bees, hoverflies and butterflies

The timing of leaf production and flowering between April and June is such that both pollination (mainly by Hymnoptera spp) and the build up of food stores within the bulb take place before the woodland canopy fully closes; thereafter the leaves die back, leaving the seed head.

The plant's contractile roots often result in the mature bulb being buried to a depth of 250mm or more. The bulbs can therefore be vulnerable to waterlogging and the more superficial bulbs of ramsons can dominate on alluvial terraces.

MANAGEMENT

Large numbers may appear directly after tree felling has taken place, with the increase in light subsequently favouring more aggressive species, such as bracken. A decline in bluebell numbers then tends to follow owing to the previous year's litter shading out the plants. With the return of the shrub and canopy species light conditions can favour bluebell growth and the population can increase again.

The replanting of woodlands with exotic species, particularly conifers, can result in the presence of continuous shade, causing a decline in the population.

Bluebells have an epicormic growth form, with a central bud producing a predetermined number of leaves and a single flower spike. Damaged leaves cannot be replaced so the species is very susceptible to grazing, cutting or trampling. Careful management of any public access and exclusion of livestock will therefore be required. Routes through woods should be limited to designated footpaths, tracks and rides, rather than open access. Where bluebells occur in grassland, early cutting and grazing should be avoided.

CURRENT STATUS AND EXTENT

Internationally the species is considered to have favourable conservation status within Europe. The UK currently holds 25-49% of the world population with records from 101+ 10km squares. The British populations are unique in producing 'carpets,' whilst European populations are usually intermixed with other woodland ground flora species.

Still to add: range of Tayside distribution (historical and recent)

CURRENT FACTORS CAUSING LOSS OR DECLINE

There is little data to ascertain population trends within Tayside but it is assumed a general decline in bluebell cover has occurred, particularly where there has been unsympathetic management of woodland habitats.

Light penetration to the woodland floor is of prime importance, so conifer plantings, which have too dense a canopy, are severely detrimental. In addition, many agricultural woodlands have been used to provide sheltered grazing for stock. This has had the effect of obliterating the ground flora, including the bluebells.

The stripping of woodlands to provide bulbs for the horticultural market appears to be, so far at least, a potential rather than current threat within Tayside.

Trampling causes localised losses and the advent of mountain biking has introduced pressure to areas previously left undisturbed.

The species is also threatened by cross-pollination with the Spanish bluebell, *Hyacinthoides hispanica,* which is widely planted in gardens and once present in the wild, gives rise to a hybrid *Hyacinthoides variablis*. Cross-pollination with the local population causes the hybrid to dominate with subsequent impacts on other dependant species.

OPPORTUNITIES AND CURRENT ACTION

The 'Bluebell Recovery Project', currently being undertaken by Landlife and the Mersey Forest Team, aims to produce a sustainable source of native bluebell bulbs to help halt the illegal trade in bulbs looted from the wild.

MAIN OBJECTIVES / TARGETS

1) Main Objectives

i) Maintain, and where possible, enhance the current populations and distribution of bluebells within Tayside

ii) Ensure the appropriate management of both existing and new woodland habitats within Tayside to facilitate the above

2) Main Targets

i) Prevent any further decline in suitable habitat and bluebell populations

ii) Promote sensitive management of habitat for bluebells, where this will not unduly compromise other biodiversity goals

3) Work Objectives

i) Carry out systemic survey and mapping of Tayside to establish current populations, status and distribution

ii) Promote appropriate methods of management of habitats where bluebells either currently, or may in the future, exist

iii) Reduce the possibility of threats to the wild population of bluebell via illegal picking, uprooting or introduction of 'garden escapes' which would result in hybridisation

4) Work Targets

i) Collate existing data regarding distribution and population of bluebell

ii) With this data as a baseline, survey and map the distribution of the species within Tayside

iii) Promote responsible habitat management to protect existing populations and where feasible, to create new populations in 'native' plantations

iv) Ensure the enforcement of schedule 13, section 8 of the Wildlife and Countryside Act, 1981

v) Use the bluebell as a 'flagship' species for awareness-raising of woodland habitats and management issues

vi) Set up management projects for the bluebell, which will complement and coincide with the projects for other woodland species and appropriate Woodland HAPs

vii) Prepare educational and interpretative materials for woodlands, which will include information on bluebells to promote the conservation of the species within Tayside

GLOSSARY OF TERMS/ ABBREVIATIONS: still to complete

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PROPOSED ACTION FOR BIODIVERSITY

	Proposal for Action – Bluebell	Potential deliverers		To take place by								Meets Obj. No.
		Lead Partner(s)	Partners	02	03	04	05	06	07	11	16	
LBAP Ref.	A. Policy and legislation											
	1. Enforce Wildlife and Countryside Act 1981 Schedule 13, Section 8.	SNH WLO'S		*	*	*	*	*	*	*	*	

	B. Site and species safeguard/ management											
	1. Obtain details of the Landlife/ Mersey Forest Team Bluebell Recovery Project (and any other Scottish Bluebell Projects) and implement similar project in Tayside	Landlife FC SNH	SNW?									
	2. Identify best practice sites and use these as examples of positive management for the species	SNH SNW										
	3. Ensure that Woodland management/ development schemes do not adversely affect bluebell populations	FC SNH P&KC AC DCC	SNW FWAG SAC									
	4. Identify any recent woodland plantings which are at a suitable stage of development for having species introduced	SNW	SNH FWAG SAC									
	C. Advisory											
	1. Promote responsible habitat management.	FC	SNW FWAG SAC									
	D. Research and monitoring											
	1. Collate existing data re. distribution & population of bluebell.	SNH SNW										
	2. Survey & map distribution of species within Tayside	FC	SNH SNW									
	3. Monitor population on a 10(?) year cycle	FC										
	E. Promotion and awareness-raising											
	1. Promote bluebell as 'flagship' species for awareness raising to the general public	LBAP P&KC AC DCC	SNH SNW Garden Centres									
	2. Prepare educational & interpretative material	Ranger Services	SNH									
	3. Promote bluebell as a 'flagship' species for positive woodland management	SNH FC	SNW SAC FWAG									
	F. Plan Monitoring											
	1. Monitor and review this plan on an annual basis and in detail every five years	TBP										

TAYSIDE BIODIVERSITY PARTNERSHIP

SLENDER NAIAD ACTION PLAN

Common Name *Slender Naiad*

Scientific Name *Najas flexilis*

SPECIES PROFILE

- **UK Biodiversity Status** — UK priority species
- **Tayside Status** — Priority species
- **Statutory Protection** — EC Habitats Directive, Annexes II and IV.
  Wildlife and Countryside Act, Schedule 8.
  Conservation (Natural Habitats, etc.) Regulations, 1994, Schedule 4.
  Bern Convention, Appendix 1.
- **UK Lead Partner (if any)** — None
- **Relevant Habitat Actions Plans** — Standing Open Waters, Mesotrophic Lochs

MAP - *assistance required from other Partners as to Tayside distribution*	
List of Key Sites	Loch of Craiglush, Loch of Lowes, Butterstone Loch, Clunie Loch, Marlee Loch?
Site Distribution	Lunan chain of lochs in the Dunkeld-Blairgowrie area of Tayside

DESCRIPTION AND HABITAT

The Slender Naiad Najas flexilis is an inconspicuous, elongated aquatic plant with simple slender leaves that clasp the stem. It is an annual plant that reproduces by seed or by fragmentation. Typically it germinates in early summer, flowers from July to September and breaks up in the autumn when fragments can be found blown onto the shoreline.

It grows well in clear lowland mesotrophic lochs (with low to medium nutrient concentrations). It can also grow in base-rich waters on limestone outcrops or in machair lochs adjoining calcareous sand dunes.

The Slender Naiad occurs in standing water from 20cm to 14m, but is most commonly found at a depth of 60cm to 2m. It is usually found in sheltered bays; it prefers fine silty substrata and the fragile plant is easily broken by strong waves, making its location within a water body dependent on the level of exposure. The depth at which it colonises is affected by the water clarity but can also be dependent on exposure; in sheltered waterbodies it may be found in the shallower water of the littoral zone.

CURRENT STATUS AND EXTENT

In the UK the Slender Naiad is found exclusively in Scotland where it has been recorded from 34 lochs within 18 ten km squares since 1980. The majority of the sites are on the Inner Hebrides, the Outer Hebrides and in the Dunkeld-Blairgowrie area of Tayside. The Lunan chain of lochs supports the only known population of Slender Naiad within Tayside. However the distribution of the plant is thought to be decreasing in this area.

Slender Naiad is listed under Annexes II and IV of the EC Habitats Directive and Appendix 1 of the Bern Convention. It is protected under Schedule 4 of the Conservation (Natural Habitats, etc.) Regulations 1994 and Schedule 8 of the WCA 1981. It appears on the UK BAP short list of priority species; there is a UK Species Action Plan for the Slender Naiad.

CURRENT FACTORS CAUSING LOSS OR DECLINE

Nutrient enrichment can affect the Slender Naiad. Nutrients enter waterbodies from a variety of sources such as sewage or agricultural effluents, fertiliser run-off from land, or the nutrient- rich wastes from fish farms. The resulting increase in photosynthesis by algae and macrophytes can lead to carbon dioxide levels in the water becoming limited. Slender Naiad cannot utilise bicarbonate in such situations as some plants can and therefore ceases to photosynthesise. As it is an annual plant such conditions may not need to be prolonged for Slender Naiad to be affected.

Excessive growth of weed can restrict light penetration through the water column, affecting the ability of Slender Naiad to photosynthesise.

Acidification may be a threat to Slender Naiad in Scotland, although this appears to be a greater problem in Ireland. Where acidification occurs Slender Naiad can fail to produce seeds which, as an annual plant, it is reliant on for regeneration.

OPPORTUNITIES AND CURRENT ACTION

The Slender Naiad was one of the original designated interests for the SSSIs on Loch Butterstone, Loch of Craiglush, Loch of Lowes, Clunie Loch and Marlee Loch, and in addition the combined designation of these as the Dunkeld-Blairgowrie Lochs cSAC includes Slender Naiad as a European interest.

SNH and SEPA have statutory responsibilities under the Conservation (Natural Habitats, etc.) Regulations 1994 to protect the designated interests of SSSI's, SAC's and SPA's. SEPA has a duty to consult SNH before authorising any activities or emissions which may affect this species or the ability of the SSSI to support it.

Research of Slender Naiad in the lochs has included a PhD on 'The Functional Ecology of *Najas flexilis*' submitted by Ruth Wingfield in March 2002. SNH contracted diving surveys that were carried out by Northern Ecological Surveys in 1997 on Loch Butterstone and Loch of Craiglush, and in 1998 Valerie James and Alan Barclay of SWT surveyed Slender Naiad distributions in Loch of the Lowes and Loch of Craiglush.

Other work includes a palaeolimnological investigation by ENSIS (University College London) in 2001 and a phosphorus budget study of Loch of Craiglush, Loch of the Lowes and Butterstone Loch in 1997. The Lochs Survey Team carried out a freshwater survey of Loch of Craiglush, Clunie Loch and Marlee Loch in 1997. SEPA prepared a review of data and proposals for action on the Lunan chain of Lochs in April 2002.

MAIN OBJECTIVES / TARGETS

Main Objectives

1. Maintain and, where possible, enhance the current populations and distribution of Slender Naiad within Tayside

2. Introduce an appropriate management programme for the Lunan chain of lochs.

3. Consider appropriate sites for the reintroduction of the Slender Naiad.

Main Targets

1. Limit the impact of development or land-use changes that could lead to increased nutrient inputs to the lochs.

2. Liaise with appropriate bodies to establish a monitoring programme to assess any changes to the loch habitat that may require management.

3. Research the possibility of establishing a new population in an appropriate site based on genetic stock from the Loch of Lowes, or strengthening the current population by replanting along shores where the species is absent

Work Objectives

1. Review the water quality data of the Lunan chain of lochs.

Work Targets

1. Promote responsible site management to protect existing populations.

GLOSSARY OF TERMS/ ABBREVIATIONS: add

REFERENCES:

- James, V.A. (1997) *The Occurrence and distribution of Najas flexilis in Loch of Craiglush,*
- *Loch of Lowes and Loch of Butterstone*. Report to Scottish Wildlife Trust, 1997.
- Stace, C. (2001) New Flora of the British Isles, 2nd Edition. Bath Press, Bath.
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- SEPA (1999) Information Annex (A-2-1-6). Natural Heritage Handbook, Issue 1. SEPA.

PROPOSED ACTION FOR BIODIVERSITY

	Proposal for Action – Slender Naiad	Potential deliverers		To take place by								Meets Obj. No.
		Lead Partner(s)	Partners	02	03	04	05	06	07	11	16	
LBAP Ref.	**A. Policy and legislation**											
	1. Ensure that all of the Lunan chain of lochs meet EU Directives in terms of designations for wildlife, importance and/or quality.	SEPA SNH						*				
	2. Contribute to the development of policies within land use development plans to safeguard the Slender Naiad within the Lunan chain of lochs.	PKC DCC AC	SNH SEPA TBP		*	*	*	*	*	*	*	
	B. Site and species safeguard/ management											
	1. Ensure that proposed developments or activities have no adverse affects on known populations of Slender Naiad.	SNH	SEPA FWAG									
	2. Ensure that the Lunan chain of lochs has a management plan implemented by 2005.	SNH					*					
	C. Advisory											
	1. Provide advice for managers and users of the Lunan chain of lochs to promote the biodiversity conservation of this habitat.	TBP	SNH SEPA	*	*	*	*	*	*	*	*	
	2. Review current water quality data to determine current status of the Lunan chain of lochs.	SEPA					*					
	3. Continue Site Condition Monitoring for SACs and SSSIs	SNH			*					*		
	4. Monitor the delivery of the action plan yearly and in detail every 5 years, starting in 2003.	TBP			*							
	D. Promotion and Awareness-Raising											
	1. Ensure widespread awareness of the biodiversity significance of the Slender Naiad, and promote the links between habitat health and distribution of the species	TBP	SEPA SNH SWT FWAG				*					

CONSULTATION DRAFT: 2ND TRANCHE – SAP/VP3

full colour transparency available √

TAYSIDE BIODIVERSITY PARTNERSHIP

WHORLED SOLOMON'S SEAL ACTION PLAN

Common Name ***Whorled Solomon's seal***

Scientific Name *Polygonatum verticillatum* (L.) All (Family: Liliaceae)

SPECIES PROFILE

- **UK Biodiversity Status** Species of Conservation Concern
- **Tayside Status** Species of Conservation concern
- **Statutory Protection** Schedule 8 of the Wildlife & Countryside Act 1981
- **UK Lead Partner (if any)** None
- **Relevant Habitat Actions Plans** Upland Oakwoods; Upland Mixed Ashwoods; Wet Woodlands

MAP – *a 10km map to be provided*

List of Key Sites/ Site Distribution
Glen Tilt Woods SSSI
Den of Airlie NNR/SSSI
Den of Reichip SSSI
Milton Wood NNR/SSSI
Craighall Gorge SSSI/cSAC
Romadie Wood SSSI
River Lyon Bank SSSI
Keltneyburn SSSI/cSAC
Wood near Pitlochry

Eight sites mostly in gorge woodlands but also one in riverine woodland; central and eastern Perth & Kinross along or north of the Highland Boundary Fault. Now not found as a native species anywhere else in the UK.

DESCRIPTION AND HABITAT

Medium sized perennial with whorls of narrow pointed leaves. Single stems produced on short rhizomes. Flowers drooping in leaf axils. Fruit red berries

- Reproduction by rhizomes and by berries; berry production inhibited by heavy shade and definite evidence of seedling production only from 1 site.
- Thought to be mainly pollinated by bumblebees.
- Prefers moist moderately base-rich soils (pH neutral, rarely above) in broadleaved gorge or riverine woodland.

- In Scandinavia it is a sub-alpine species associated with species such as Alpine sow-thistle *Cicerbita alpina* and wood crane's-bill *Geranium sylvaticum*. May have been lost from this habitat in the UK through grazing pressure.
- Usually found in National Vegetation Classification communities W9 and W11; one site in W7 [may actually be found in W10 rather than W11].
- In Scandinavia also characteristic of wood meadows. Management such as brash pile creation, and burning of brash has been found to reduce competition with other species.

MANAGEMENT

Requires moist moderately base rich soil in shade light enough to allow berry production but reduce competition from other more vigorous woodland plants.

CURRENT STATUS AND EXTENT

- Eurasian, mountain ranges from North Spain to the Himalaya, and north to Scandinavia
- Formerly found in Angus and north-east England. 12 sites known in Perth & Kinross, but of these 4 are now extinct, including one since late 1990's.
- A difficult species to find, but no new sites have been recorded since 1913.
- In cultivation in UK since at least 1597, and occasionally naturalised in Scotland.

Monitoring and research work in the 1990s particularly by SNH (2000 and 2001), Wright (1998) and Wright et al (1993), have produced the following population estimates:

Site	Site status	Number of populations	Date of most recent count	Total Population size	Number of populations > 25 stems	Site condition*
Craighall Gorge	SSSI/cSAC	5	2000/1	169 *	4	Favourable; one population has declined significantly
Den of Airlie	NNR/SSSI	1	2000	101 - 1000	1	Favourable
Den of Reichip	SSSI	3	1993	140	3	Favourable
Glen Tilt	SSSI	1	2001	Extinct	0	Un-favourable: lost from site Plants last seen in late 1990s
Keltneyburn	SWT reserve; SSSI/cSAC	1	2000	85	1	Un-favourable
Wood near Pitlochry	-	7	1996	283	4	Favourable
Milton Wood	NNR/SSSI	2/3	2000	22	0	Un-favourable
River Lyon Bank	SSSI	1	2000	34	1	Un-favourable
Romadie Wood	SSSI	1	2000	9	0	Un-favourable

* based on the SNH Site Condition Monitoring assessments; Glen Tilt and Milton Wood will be excluded from future SCM assessments

** excludes population known as E4 for which no locational information exists.

CURRENT FACTORS CAUSING LOSS OR DECLINE

A variety of factors can adversely affect this species, but only one or two may operate in each population or site.

Small population effects: 4 sites are currently unfavourable because of small population sizes. Most populations are isolated, even within sites. Most populations probably consist of clones of only one or two genotypes. Cross-pollination between sites is probably very rare.

Dutch elm disease: Although excessive shade inhibits flowering and berry production, too little can result in the growth of other competitive plants species and drier soils in the summer.Tree loss might also allow greater water run off causing erosion after heavy rain

Wayleave management: One population lies under an electric power line. Scrub and tree clearance have recently threatened this population, although in Scandinavia in traditional management of wood meadows, brash piles have been shown to reduce competition.

Excessive shade: Shade from non-native trees (especially beech and conifers) and competitive ground vegetation such as ferns, appears to be inhibit seed production.

Lack of woodland: The historic loss of woodlands, particularly in the uplands and along rivers may have significantly reduced available habitat. Indeed, its sub-alpine habitats may have completely disappeared largely through grazing.

Podsolisation: conifers and other species such as beech can increase soil acidification and nutrient loss, thereby reducing areas of suitable habitat.

Woodland management: Most sites are SSSIs and SNH should be able to comment on most proposals to change management. One site is undesignated, and statutory consultation is not required. Changes to woodland management such as felling or the introduction of grazing could have adverse effects.

Solomon's seal sawfly; a sawfly *Phymatocera aterrima* has recently been introduced in the UK. In some years this species can cause leaf/seedling damage.

Lack of seed production: Evidence of seed production is very limited, and relates to reports of single leaf plants at some of the larger populations. Seedling production only definitely recorded from one site.

The following table gives those factors which are currently operating at each site:

Site	Long term trend	Adverse factors affecting, or potentially affecting, populations
Den of Reichip	Healthy population	Wayleave management
Romadie Wood	Relict of larger population; previously two populations, now one; threatened	Small size of woodland; no seed set
Milton Wood	Previously one of strongest populations; threatened	Beech/rhododendron invasion restricting suitable habitat; grass understorey; limited seed production; difficult site to survey
Den of Airlie	Historically more than one population, now only one; current population apparently grown from relatively small one. Only site known to have reproduced sexually.	None known
River Lyon Bank	Relatively stable population;	Seed viability is low. Limited size of woodland
Keltneyburn	Relatively stable; one population apparently lost since 1930's/60's.	Competition from ground flora inhibiting seed set

Site	Long term trend	Adverse factors affecting, or potentially affecting, populations
Wood near Pitlochry	Population since end of 1800's. Trends unknown; current population healthy	None known but seed set inhibited possibly by competition from ground vegetation. Non-SSSI site
Glen Tilt	Sharp fall in population size from mid 1980's; now extinct	Erosion of wet bank possibly exacerbated by tree loss leading to greater water run off; climatic change with wetter winters?
Craighall Gorge	One population has declined markedly; trends in others unknown	Loss of elm trees at declining population may have led to greater competition from other species and/or drought in summer; at all populations seed production either absent or limited. No locational data on one population found in 1990's

OPPORTUNITIES AND CURRENT ACTION

Current actions

Small numbers of seed have been collected from Den of Airlie (113 seeds in 1992), Den of Riechip (1996) and Craighall Gorge in the 1990's as part of the Millennium Seed Bank Project overseen by the Royal Botanic Gardens at Kew.

Two pieces of rhizomes were collected from Glen Tilt in the mid 1990s and cultivated at the Royal Botanic Gardens Edinburgh. One piece has been successfully propagated. The objective was to safeguard material from this site with a view to possible re-introduction.

All populations in SSSIs have been monitored by SNH as part of its Site Condition Monitoring programme. Sites were last monitored in 2000 and 2001, and except for Glen Tilt and Milton Wood, will be monitored in future on a six year cycle. All SSSIs are the subject of Site Management Statements, and the NNRs of management plans.

SWT have at least occasionally (eg 1999) managed ground vegetation to reduce shading of the population in Keltneyburn.

This species is the subject of an entry in the Threatened Plants in Scotland CD produced by SNH. Conservation priorities are considered to be:

- Increase size of two declining populations by suitable management [not specified but probably Milton Wood and Glen Tilt]
- Consider the need to replace the population threatened by erosion [namely the Glen Tilt site where now extinct]

Craighall Gorge and Keltneyburn cSACs are both the subject of a LIFE III Woodland project coordinated by Highland Birchwoods which aims to develop conservation management to the benefit of the Tilio-Acerion gorge woodland communities.

Opportunities

The following possible actions could be undertaken:

Den of Reichip:	Investigate potential of using brash piles to safeguard population under wayleave
Romadie Wood:	Search for missing population; bring material into cultivation; augment population by translocation; investigate potential to increase woodland size
Milton Wood	Bring material into cultivation; remove beech and Rhododendron from site; augment population by translocation
Den of Airlie	Search for new populations
River Lyon Bank	Bring material into cultivation; augment population by translocation

Keltneyburn	Search for more colonies; reduce competition from ground vegetation to promote seed set; augment population by translocation
Wood near Pitlochry	Reduce competition from ground vegetation to promote seed set
Glen Tilt	Re-introduce plants from RBGE cultivated material; search for new populations
Craighall Gorge	Reduce competition from ground vegetation to promote seed set; relocate 'lost' population; consider removal of conifers and beech from around populations.

MAIN OBJECTIVES / TARGETS

Aim: to maintain a viable population of Polygonatum verticillatum in Tayside by ensuring that all sites are in favourable condition according to the SNH SCM criteria.

Objectives:

1. To reduce the potential loss of genetic variation by bringing into secure cultivation rhizomes from threatened populations at Milton Wood, Craighall Gorge and Romadie Wood.

2. To seek to encourage greater seed production by habitat management at sites where seed production is currently inhibited (Keltneyburn, Craighall, Gorge, wood near Pitlochry)

3. To carry out Site Condition Monitoring at each population every 6 years

4. To translocate cultivated material to most threatened sites to augment existing populations or create new populations (Glen Tilt and Romadie Wood).

5. To seek to remove or control regeneration of conifers and beech from around existing populations or in potential new locations for populations (Glen Tilt, Milton Wood, Craighall Gorge)

6. To seek to expand smaller woodland sites to create suitable woodland habitat (Romadie Wood, River Lyon Bank)

7. To collect seed from populations at Den of Airlie, Den of Reichip and Craighall Gorge to create a sufficiently large seed collection in the Millennium Seed Bank.

8. To search for additional or 'lost' populations at Glen Tilt, Den of Airlie, Keltneyburn, and Craighall Gorge.

GLOSSARY OF TERMS

to include - **Site Condition Monitoring**: monitoring carried out by SNH on a six yearly cycle of the notified (=designated) interests of all Sites of Special Scientific Interest. The criteria for vascular plants include: a minimum of two populations per site with each population containing at least 25 individuals.

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- Wright, Jenny 1998 *An ecological basis for the conservation of* Polygonatum verticillatum *(L.) All., Whorled Solomon's seal in Scotland*, A thesis presented for the degree of Doctor of Philosophy, University of Aberdeen.
- Scottish Natural Heritage 2002 *Threatened plants in Scotland*, Scottish Natural Heritage, Compact Disk

PROPOSED ACTION FOR BIODIVERSITY

	Proposal for Action – Whorled Solomon's Seal	Potential deliverers		To take place by								Meets Objective No.
		Lead Partner(s)	Partners	02	03	04	05	06	07	11	16	
LBAP Ref.	A. Policy and legislation											
	B. Site and species safeguard/ management											
	1. Bring into secure cultivation rhizomes from threatened populations at Milton Wood, Craighall Gorge and Romadie Wood.	SNH	RBGE Landowner			*						1
	2. Undertake habitat management at sites where seed production is currently inhibited (Keltneyburn, wood near Pitlochry)	SWT	Landowner			*						2
	3. Translocate cultivated material to most threatened sites at Glen Tilt and Romadie Wood.	SNH	Landowner							*		4
	4. To seek to remove or control regeneration of conifers and beech in Glen Tilt, Milton Wood, Craighall Gorge	SNH	Landowner			*						5
	5. To seek to create suitable woodland habitat at Romadie Wood, River Lyon Bank	SNH	Landowner			*						6
	6. To collect seed from populations at Den of Airlie, Den of Reichip and Craighall Gorge for the Millennium Seed Bank	BSBI	SNH Landowner						*			7
	C. Advisory											
	D. Research and monitoring											
	1. Carry out Site Condition Monitoring at each population every 6 years	SNH	BSBI		*				*			3
	2. To search for additional or 'lost' populations at Glen Tilt, Den of Airlie, Keltneyburn, and Craighall Gorge	BSBI	SNH SWT				*					8

	E. **Promotion and awareness-raising**											
	1. Species is highlighted on the Perthshire Herbarium website and will be featured in the Biodiversity Exhibition 2004 (Perth Museums)	PKC TBP										
	2. Include species in the proposed "Theatened Plants of Tayside" publication that could follow on from the Biodiversity Exhibition	TBP	PKC BSBI PSNS Dundee Naturalists SWT SNH									
	F. **Plan Monitoring**											
	1. Review plan on an annual basis and in detail every five years	TBP										