WETLANDS FOR WILDLIFE

(Contributing author: Ken Smith, INCA)

Pools and wetlands are amongst the most valuable and vulnerable of wildlife habitats. They are also one of the habitats which show the fastest results after they have been created. Within 12 months of pond creation, colonies of aquatic plants and animals can be thriving and within two years of creation, man-made wetlands can be well established and appear a natural part of the landscape.

LOCATION

An area of low lying and naturally waterlogged land is obviously a good site for developing as a pond or wetland. It must be understood that a pond will only remain completely full if it is excavated below the natural water table of the area. Many artificial ponds and wetlands which are above the local watertable will need to be lined with an impervious membrane and may need to be topped up with water during dry periods. Thus the source and cost of summer water supply and design of the pipework installation needs to be considered when planning a perched (above the water table) pond. If the subsoil at the site is impervious clay, then a pool can be made merely by excavating to the desired shape and depth. If the ground is porous and well drained, the pond and wetland area will need to be lined with some form of artificial membrane or clay imported onto the site and puddled into the excavated depression.

Sunlight plays an important role in the development of the flora and fauna of ponds and wetlands. A pond situated in the shade will not be as productive as one that gets adequate sunlight and may also become stagnant.

A few overhanging trees can look attractive around large wetlands and lakes, but this should not be overdone and is best avoided completely in the case of smaller ponds. Trees not only shade the water, but leaves falling into the pond can result in deoxygenation of the water. However, trees such as willow, alder and aspen are important features of wetland sites and form good windbreaks, especially on the northern side of a pond. Trees should not be planted within 20 metres of a lined pond as their roots can eventually damage the pond liner.

POND LINING

If a pond is excavated above the summer water table, in most cases it will need an impervious lining to prevent the water leaking away in the summer. The main exception to this principle is if the pond has been excavated in an impervious clay subsoil.

If an impervious clay (i.e. not a calcareous clay or marl) can be obtained cheaply, the pond can be

excavated 500mm. deeper than its intended water depth and lined with 500mm. of clay, which is then heavily compacted by tracked or wheeled vehicles (a JCB digger is ideal), then thoroughly wetted and further compacted (puddled). It should not be allowed to dry out between puddling and filling the pond or wetland.

More usually, an artificial impervious membrane of bentonite, plastic or butyl rubber is used as a liner. Manufactured bentonite linings are very easy to install and can be relatively resistant to deliberate vandalism. They are less resistant to perforation by plant roots, thus tend to leak a few years after installation. However, installation is simple, they are simply rolled out like a carpet, joins are overlapped and weighted with stones or soil, and the pond filled

Various heavy-gauge plastic sheets are available for pond lining. The very thick gauges can be difficult to handle and to join on uneven contours. Thinner sheets are relatively cheap but can be easily pierced by stones and plant roots.

Butyl liners are flexible, relatively resistant to perforation, easy to join but relatively heavy to handle and more expensive than thinner plastic liners.

In general the installation of plastic or butyl liners is similar, a procedure for which is described in the **appendix** to this guide.

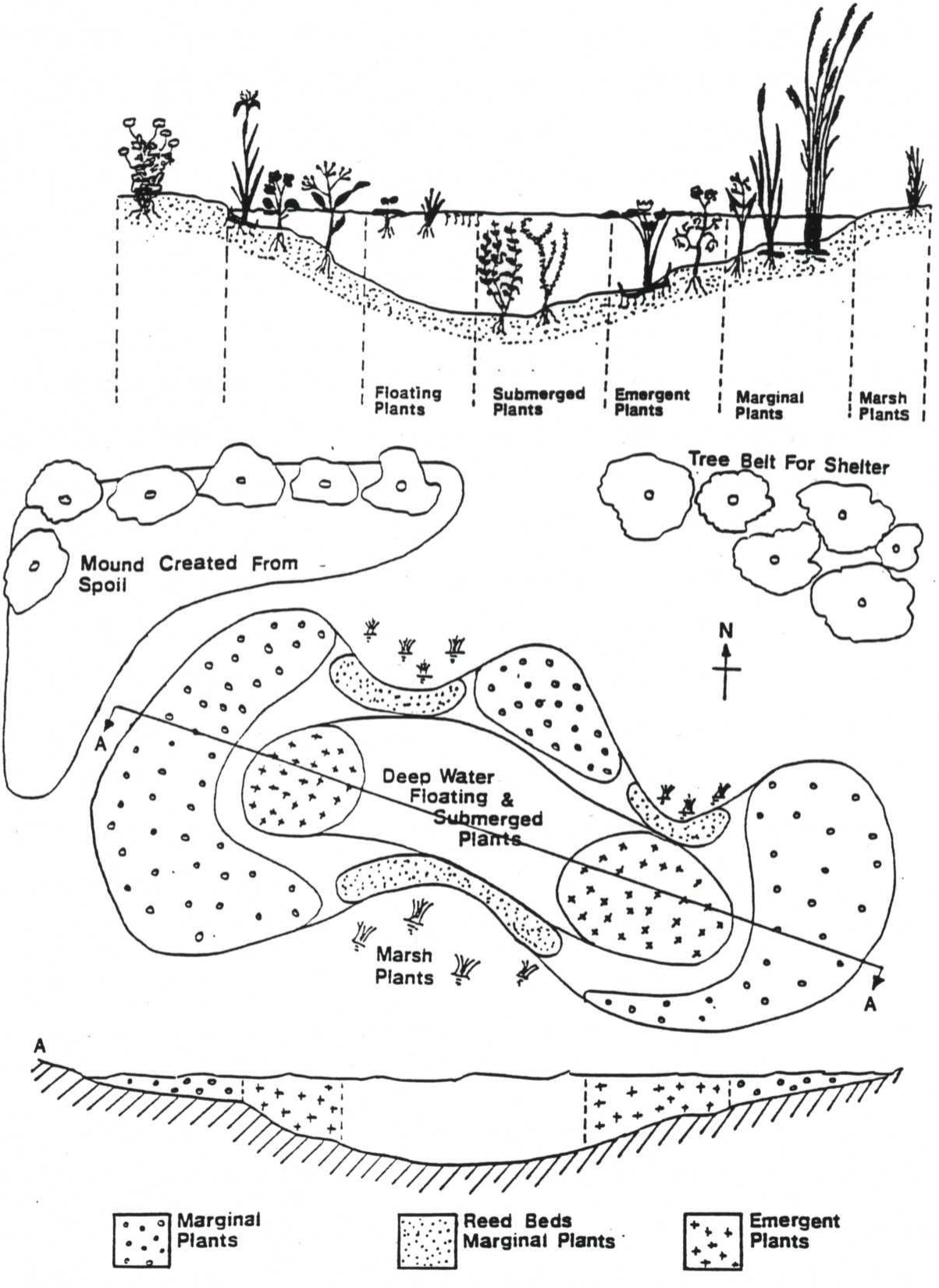
POND DESIGN

Different plants and animals have different ecological requirements, so it is important that the main purpose of the pond and wetland is defined at the planning stage so that it can be designed accordingly. For example a habitat for water birds has different structural requirements to a pond intended for visits by young children. There are a number of basic principles that apply to most situations.

Larger ponds are generally ecologically better than smaller ones and irregular shapes look more natural than formal geometric shapes. Gradually sloping shorelines leading into deeper water of approximately one metre are usually much better for wildlife than abrupt steep edges. High banks should only be used on larger ponds and lakes where special habitats such as nesting sites for sand martins or kingfishers are required. Even in such ponds, a significant area of bank should be constructed with a shallow slope to the water to allow egress by amphibians and small mammals such as hedgehogs.

An example of a pond and wetland area design intended primarily to support wildlife on a large site (probably greater than most private gardens) is shown below. A garden pond may be of similar depth but have a more formal and smoother margin.

POSITIONING POND PLANTS



AQUATIC PLANTS

Water plants can be divided into five main types:

1 Marsh plants that live in waterlogged conditions of wetland habitats.

2 Marginal plants living in the shallow edges of pools. These provide cover for nesting birds and aquatic invertebrates as well as stems for insects such as dragonflies to climb when emerging from the water.

3 Emergent plants such as water lilies are rooted in deeper water but leaves and flowers protrude above the surface. Water lilies can help reduce the development of “green water” due to excessive algae growth resulting from over enrichment with nutrients. The large leaves of waterlilies shade some of the water and control the growth of algae.

4 Submersed plants live under the surface of the pond and provide food and cover for aquatic animals, also releasing oxygen into the water. Underwater weed beds should not normally be allowed to become so dense that they choke the pond, since excessive weed growth reduces water movement and gas exchange.

5 Floating plants are not anchored by roots, feeding directly from the nutrients in the water. They should not be permitted to cover too much of a pond surface or they will shade the submersed plants and drastically reduce gas exchange at the water surface. However, regular harvesting of floating and submersed plants can assist in reducing the plant nutrients in the water, thereby discouraging algal growth.

WETLAND AND POND MARGIN PLANTS

Water plantain	*Alisma plantago-aquatica*
Wild angelica	*Angelica sylvestris*
Flowering rush	*Butomus umbellatus*
Marsh marigold	*Caltha palustris*
Meadowsweet	*Filipendula ulmeria*
Water avens	*Geum rivale*
Policeman’s helmet	*Impatiens glandulifera*
Yellow flag	*Iris pseudacorus*
Ragged robin	*Lychnis flos-culculi*
Gypsywort	*Lycopus europaeus*
Purple loosestrife	*Lythrum salicaria*
Monkey flower	*Mimulus gutatus*
Water forget me not	*Myosotis scorpioides*
Fine-leafed water-dropwort	*Oenanthe aquatica*
Parsley-leaved water-dropwort	*Oenanthe lachenalii*
Celery-leaved crow-foot	*Ranunculus sceleratus*
Danewort	*Sambucus ebulus*
Fig wort	*Scrophularia nodosa*
Globe flower	*Trollius europaeus*
Butterbur	*Petasites hybridus*
Water violet	*Hottonia palustris*
Bogbean	*Menyanthes trifoliata*

EMERGENT PLANTS

White waterlily	*Nymphaea alba*
Yellow waterlily	*Nuphar lutea*
Pond water-crowfoot	*Ranunculus peltatus*
Amphibious bistort	*Polygonum amphibium*

SUBMERGED WATER PLANTS

Water starwort	*Callitriche spp.*
Water millfoil	*Ceratophyllum demersum*
Curled pondweed	*Potomageton crispus*
Broad-leaved pondweed	*Potamogeton natans*

GRASSES, SEDGES, REEDS AND RUSHES

Reed canary-grass	Phalaris arundinacea
Pendulus sedge	Carex pendula
Glaucus sedge	Carex flacca
Soft rush	Juncus effusus
Hard rush	Juncus inflexus
Bulrush	Schoenoplectus lacustris
Sea club-rush	Scirpus maritimus

Note;
It is not advisable to plant *Phragmites* and particularly *Typha* in small ponds less than two metres deep since these species grow fast and can be very invasive. Their shoots also tend to pierce pond liners. In larger ponds and lakes however, *Phragmites* is particularly useful for nesting birds. Both *Phragmites* and *Typha* might require management even in quite large ponds, but can be partially restrained by a water depth of two metres or more. Another invasive submerged species is *Elodea canadensis.* It should not be introduced.

SEED AND PLANT SUPPLY

Herbiseed can supply seed of many species of pond plants, and can grow plug-plants on contract for your new pond. We also supply seed mixtures of grass and appropriate wildflowers for pond margins and wetlands. See www.herbiseed.com/wildflowers.

ANIMAL LIFE FOR WETLAND HABITATS

Birds will naturally colonise suitable habitats, as will highly mobile inverterbrate species such as waterbeetles and dragonflies. A couple of months after establishment, new wetlands and ponds can be “seeded” by introducing mud from nearby mature ponds. Amphibian spawn can also be introduced. However, take care in the selection of ‘donor ponds’. It is strongly recommended that donor ponds are thoroughly searched to eliminate the danger of transporting invasive plant species such as *Crassula helmsii* (New Zealand pigmyweed), *Myriophyllum aquaticum* (parrot’s feather) into the new pond

Waterbirds

Birds generally require relatively large areas, so wetlands designed for waterbirds must be as big as possible and islands should be included to encourage nesting. Depending on the species being encouraged to settle, the islands can either be planted with suitable vegetation, such as reeds and willows to provide nesting sites for ducks, grebes, coots and moorhens, or left bare with a gravel or sandy surface to attract terns, plovers or common sandpipers.

Fish

Fish should not be introduced unless ponds are at least 10 metres across and at least one metre deep - not even sticklebacks. Small ponds can be very attractive to amphibians, but these rarely thrive if fish are also present. If it is envisaged that the pools will be used for pond dipping by school parties, then it is important that those containing minnows and sticklebacks are kept separate from frog and newt ponds. Care must be taken to ensure that live specimens caught for study are returned to the correct pond. Note: Some fish eggs may be unintentionally introduced if mud or plants are brought from other ponds that already contain fish!

Indigenous species of fish can be introduced into lakes or large ponds with adequate vegetation cover and at least one metre depth to prevent total freezing in winter. Before any fish are introduced advice should be obtained from the Environment Agency.

Amphibians

Common frog, common toad, smooth newt, palmate newt and great crested newt are all found widely in wetlands in the Britain. Although different species have different ecological requirements several species can occur at the same site. Responsible movement of spawn from well populated ponds to newly created ones can be effective and of conservational value. Note that both the great crested newt and the natterjack toad are specifically protected under the Wildlife and Countryside Act 1981. A licence from English Nature is required to catch or handle adults or tadpoles of either species, *e.g.* for study or photography, even when the animals are to be subsequently released.

FURTHER ASSISTANCE

The Herbiseed team of ecologists and habitat creators are available to discuss wetland and other habitat creation and management plans with our clients. We can contribute sound ecological advice and practical reality at the planning stage, the site management plan, and if desired, project manage the construction of the habitat.

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APPENDIX

GENERAL SPECIFICATION FOR POND LINER INSTALLATION

1 Survey the site and agree the position, shape and contours of the pond with the project ecologist.

2 The pond should be dug 50 centimetres deeper than the intended water depth and at least 100 cm. wider than the intended final water surface. Note that a contoured floor of the pond increases the difficulty of joining plastic or butyl liners.

3 For each four square metres of water surface, one cubic metre of soil should be retained nearby for placing on top of the liner. This soil must be selected and approved by the site supervisor as being completely free of sharp stones. If this is impossible, stone-free soil, sand or rounded pebbles must be imported.

4 Remove the remainder of excavated material to a tip as directed by site supervisor.

5 Smooth all contours of the excavation and remove any protruding stones by hand.

6 Line excavation with 20mm. of stone free sand or sifted soil.

7 Lay a tough membrane such as Mypex or Geotex over the sand, extending to at least 50 cm beyond the edges of the intended water surface. Adjacent sheets of membrane must be overlapped by at least 20 cm. This is to protect the impermeable membrane from stones in the subsoil and stresses caused by settling of the subsoil.

Where a wetland is to be created adjacent to the pond, the membrane must extend 50 cm. beyond the margin of the wetland.

9 Carefully rake protruding stones away from an area of at least 100 square metres adjacent to the pond and convenient for handling the pond liner.

10 Off-load pond liner on this cleared area but do not unroll it

11 When handling the pond liner, take extreme care to avoid perforating it. Look out for protruding nails in pallets, stones on the standing area, spades and other sharp implements.

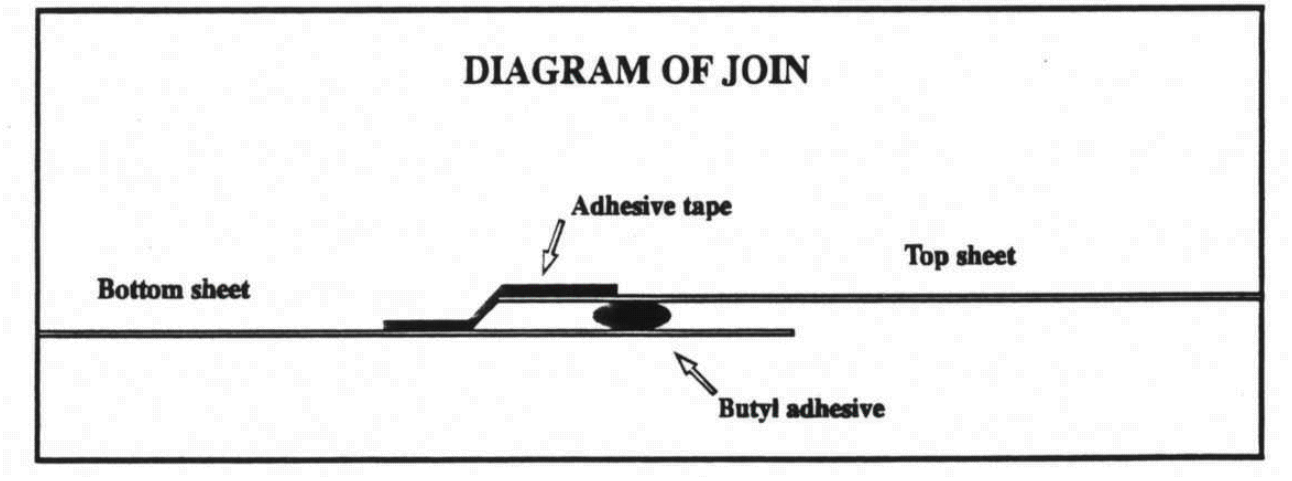
12 If the size of the pond requires more than one sheet of liner, it must be unrolled in dry weather. The excavation must be free of standing water and the edges of each sheet kept perfectly dry.

13 Unroll the liner on top of the Geotex membrane.

14 If more than one sheet is to be used, unroll and position all sheets ensuring at least 20 centimetres overlap of adjacent edges. Bentonite membranes are effective if the adjacent sheets are simply overlapped. Plastic sheets can be chemically bonded but are best professionally welded in situ. Butyl sheets can be welded, but bonding as follows is effective.

15 Carefully ensure that each surface to be joined is clean and dry.

16 At each junction, fold back the upper sheet to reveal the edge of the lower sheet.



17 Unroll a strip of butyl adhesive on the lower sheet 10 centimetres in from the edge, remove its paper backing and press the upper sheet down on the adhesive and firm it thoroughly.

18 Apply 75 mm. adhesive tape over the edge of the upper sheet to stick it down to the lower sheet (see diagram).

19 Carefully cover the entire liner with 30 centimetres of the reserved stone-free soil, or pebbles using wheelbarrows and nail-free planks placed on top of the soil, not directly on the liner. Level this by hand, taking care to avoid damaging the liner.

20 Obtain approval of site ecologist for soil levels and liner edge burial.

21 Fill with water to a defined level.

22 Check for leaks by measuring the amount of water added to maintain level in comparison with evaporation figures from nearest meteorological station.

23 When planting into the pond soil, take care (using hand trowels not spades) not to damage the liner.

Technical consultancy on the creation of wetlands and other habitats may be obtained from:

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