

Changes in the distribution and abundance of the bulrush and common reed in Lough Carra Co. Mayo.

Chris Huxley

December 2007

A report submitted to the National Parks and Wildlife Service

Summary

The extent and distribution of the stands of common reed *Phragmites australis* and bulrush *Scirpus lacustris* in Lough Carra were mapped in 2003 and 2007 using a GPS and DMAP software. The results were compared to those obtained in 1975 by Jonathan Shackleton, and the three reedbed transects he surveyed were re-surveyed using the same methodology.

There has been an increase in the extent of some of the reedbeds over this period, although the density of reeds along the three transects has apparently decreased. There has been a marked increase in the number of stands of bulrush (133% overall), and their distribution in the lake has become more extensive.

It is suggested that, although some of these changes might be expected as part of the natural succession processes, the pronounced eutrophication of the lake is, at least in part, responsible for the dramatic increase in bulrush growth.

It is recommended that a monitoring programme be established to document the speed and extent of the changes identified through this study.

Introduction

The site synopsis for Lough Carra notes that it is “one of the best examples in Ireland of a hard water marl lake” and that the overall site is “of considerable conservation importance as it has good examples of six habitats listed on Annex I of the EU Habitats Directive: lowland oligotrophic lakes, marl lakes...Some of these habitats are amongst the best examples of their kind in the country.” However, recent research has demonstrated that Lough Carra is now mesotrophic and that the process of eutrophication is proceeding as nutrient inputs continue at increased levels, with concomitant changes in the aquatic ecology of the lake. The work of the Western River Basin District Project under the EU Water Framework Directive has identified Lough Carra as being at risk of failing to meet the required ecological status if these problems are not effectively addressed.

Anecdotal information suggested that there have been significant changes in the extent and distribution of the stands of common reed *Phragmites australis* and bulrush *Scirpus lacustris* as well as an increase in growth of some aquatic macrophyte species (such as *Myriophyllum*) over the last ten or twenty years. This prompted an

exercise to repeat the 1975 work of Shackleton in mapping the reedbeds and stands of bulrush and recording the density of selected stands of reeds.

Objectives

The objective of this project was to compare the distribution and extent of stands of bulrush and common reed in Lough Carra at present with those recorded in 1975 by Shackleton.

Methods

Reedbeds and stands of bulrush were mapped using a hand held GPS in a small boat (17 feet long and powered by a 5 h.p. outboard motor) and DMAP software. The boat was driven slowly around the edge of each reedbed or bulrush stand, recording location at approximately 5 metre intervals. The boat was kept as close as possible to the outer edge of each stand such that it was, for much of the time, brushing against the outermost stems. Close to the lakeshore, if the water was too shallow for the boat, the data were collected by wading, on foot.

Since the outer boundary of a reedbed or bulrush stand is usually irregular and often heavily indented, judgements had to be made as to what constituted the edge. In general, if an indentation was greater in width than about 5 metres, the boat was guided into the indentation. If it was less than about 5 metres, the boat was driven across the indentation.

The data from the GPS were downloaded onto a PC and processed using DMAP.

There were a very few locations around the lakeshore which were inaccessible to the boat because of shallow water, but which could not be surveyed on foot either because of the soft nature of the lake bed. These will appear on the map as parts of existing reedbeds. However, with the exception of the bays along the shoreline at Kilkeeran, these errors are insignificant.

The three transects recorded by Shackleton were re-surveyed using the same methodology.

Each stand of bulrush was categorised subjectively as being “Dense”, “Sparse” or “Very Sparse” in an effort to discriminate broadly between stands that were clearly well established and those that probably represent recent colonisation, or growth in areas of marginal acceptability to the species. If a stand contained areas falling into more than one category, the stand was assigned to the more dense category. The attached photographs illustrate these three broad categories.

Since some of the changes apparent from this work were quite substantial and did not necessarily match an overall pattern, Jonathan Shackleton was asked to confirm certain points through a site visit. This he did, with the result that all such changes were confirmed to be genuine and not due to misinterpretation of or omission from his map.

Results

A. Reeds

The distribution of reedbeds in 2003 is shown in the attached map 1. There are two maps available from the 1975 work of Shackleton which record the location of reedbeds. One is drawn in colour on the six-inch OS map, the other is in black and white at an unknown scale, but with the whole lake represented in one A4 sheet (see map 3). The former provides much greater detail of both the extent and the density of reedbeds and would, therefore, allow for a more precise analysis of changes. However, it is beyond the scope of this study (and beyond the capabilities of the computer resources available) to provide a precise quantitative comparison of the area of lake surface covered by reeds. This would probably be a useful exercise in the future, but would be dependent on the availability of appropriate computer equipment to permit digitisation of Shackleton's map and subsequent electronic comparison with the 2003 data.

Nonetheless, visual comparison of the two maps does show clearly that there has been an increase in the extent of reedbeds in some areas of the lake. This increase is most apparent in the Moorehall bay of the southeast basin, the area between the Kilkeeran peninsula and Otter Point, the channel between Kilkeeran and the Derrinrush peninsula, the bay to the south of Cloonee House and the area to the south of the easternmost point of Leamnahye island. It is also clear that there are areas of the lake where Shackleton recorded "vegetation absent" where, in 2003, reeds were recorded. This applies particularly to the enclosed bay on the shoreline of Kilkeeran townland and the northernmost part of the bay to the west of Moynish Island.

Conversely, there is one bay where reeds were present in 1975, but absent in 2003 (the bay south of Rineen).

It also became clear during the mapping exercise that there are reedbeds which are now much more dense than in 1975. Indeed, in some parts of the lake, the process of terrestrialisation is occurring and, at Castleburke, what was reedbed in 1975 is now willow carr, with this observation being confirmed through examination of an enlargement of the 1973 aerial photograph.

A summary of the results arising from the reedbed transect surveys is shown in Table 1, together with the data collected by Shackleton in 1975. The data are shown in summary form since comparison of the data on a quadrat by quadrat basis does not seem to show any obvious pattern. The totals for all three transects combined are shown in Table 2.

Table 1. Reedbed transect data summary

	Transect 1		Transect 2		Transect 3	
	1975	2003	1975	2003	1975	2003
Total number of <i>Phragmites</i> stems	193	93	246	164	137	150
Total number of <i>Phragmites</i> stems with flowers	39	33	65	116	56	102
% of <i>Phragmites</i> stems with flowers	20.2	35.5	26.4	70.7	40.9	68.0
Total number of <i>Scirpus</i> stems	4	11	8	127	33	0

Table 2. Reedbed transect data overall totals

	1975	2003
Total number of <i>Phragmites</i> stems	576	407
Total number of <i>Phragmites</i> stems with flowers	160	251
% of <i>Phragmites</i> stems with flowers	27.8	61.7
Total number of <i>Scirpus</i> stems	45	138

B. Bulrushes

A total of 168 stands of bulrush were recorded during this study. These are shown on the accompanying map 2, with the three categories of density represented by increasing shades of green for increasing density. There are two maps available from the work of Shackleton which record the location of stands of bulrush. One is drawn in colour on the six-inch map, the other is in black and white at an unknown scale, but with the whole lake represented in one A4 sheet (see map 3). On this latter map, a total of about 52 stands of bulrush are recorded, whereas on the more detailed colour map a total of about 72 stands are shown. Therefore, for the purposes of comparison, the data from the detailed colour map are used.

Table 3. Number of stands of bulrush

	JS data 1975	CH data 2007	Increase 1975-2007	Percentage increase
NW basin	12	43	31	258%
SE basin	60	125	65	108%
Totals	72	168	96	133%

Table 3 shows that there has been a substantial increase in the number of stands in both basins of the lake over the last 32 years. It is possible that a small part of this increase may be due to Shackleton recording a single stand which the current survey recorded as two or more stands. However, by comparing the detailed map drawn by Shackleton with that produced from the present study, it is clear that there are many stands of bulrush that have appeared in entirely new locations since 1975. This is particularly so in the north-west basin, where the 2007 number is approaching three times that recorded in 1975. It is also noticeable that several large stands recorded by Shackleton are now even more extensive.

The increase in bulrushes is also noticeable from the data obtained in the reedbed transects. Table 2 shows that the total number of bulrush stems recorded on all three transects combined has increased from 45 in 1975 to 138 in 2007.

Many of the “new” bulrush stands were recorded as “sparse” or “very sparse”, suggesting that they are relatively fresh colonies that have not yet become well established.

Discussion

There is little doubt that, overall, the growth of reeds in Lough Carra has increased since 1975. Although there are a few small areas where reeds recorded in 1975 are no longer present, there are many areas where existing reedbeds have become more extensive and also areas where new reedbeds have appeared.

The data arising from the reedbed transects is more confusing and difficult to interpret, especially in the light of the pattern that has emerged from the mapping exercise. There has apparently been a clear decrease in the overall density of the reedbeds, as measured through the transects, with the total number of stems recorded in all the quadrats dropping from nearly 600 to just over 400. This would suggest that either the reedbeds are generally becoming more sparse, or the variation from one year to another is greater than the long-term variation. Only further research would determine which of these applies.

Despite the apparent decrease in density of reeds, the proportion of stems bearing inflorescences was very much greater in 2003 than in 1975. It seems possible that this result is of some ecological significance, but must remain unexplained here.

The changes in the extent of bulrush stands is much more noticeable and it seems unlikely that this can be explained purely as part of natural ecological succession. The only major factor that is known to have changed over the period involved is the level of nutrients in the lake.

It should be expected that the process of terrestrialisation would be observed in Lough Carra, and this can indeed be observed in several places. What is not clear is how much anthropogenic factors are affecting the process. The lake is known to have been going through a pronounced eutrophication, and it seems probable that increased nutrients would lead to increased growth of both reeds and bulrushes. In addition, the

water level in the lake is artificially controlled, and this will undoubtedly also affect the process, although whether positively or negatively is open to speculation.

Recommendations

Since it is clearly apparent that the reeds and bulrushes in Lough Carra are undergoing some significant changes and, in view of the SAC status of the lake, it is important to know whether these changes are anthropogenic, it is recommended that:

1. The 1975 coloured map prepared by Shackleton should be digitised so that current and future reedbeds and bulrush stands can be quantitatively compared with the 1975 information.
2. A monitoring programme should be established to:
 - repeat the reedbed transects on a regular basis; and
 - compare overall reedbed densities with the 1975 data.
3. Monitoring plots and/or transects should be established to continue to quantify the increase in the number and density of bulrush stands.

References

Anon. Undated (ca.1980). An Interim Report on the State of Knowledge of the Natural History of an Area in South Mayo. Unpublished report (held in NPWS).

Shackleton, J. Undated (ca. 1975). A study of certain aspects of the vegetation of Lough Carra, Co. Mayo. Unpublished report (held in NPWS).

Chris Huxley
Carrajames
Belcarra
Castlebar
Co. Mayo.
094 9032422
chrishuxley@eircom.net

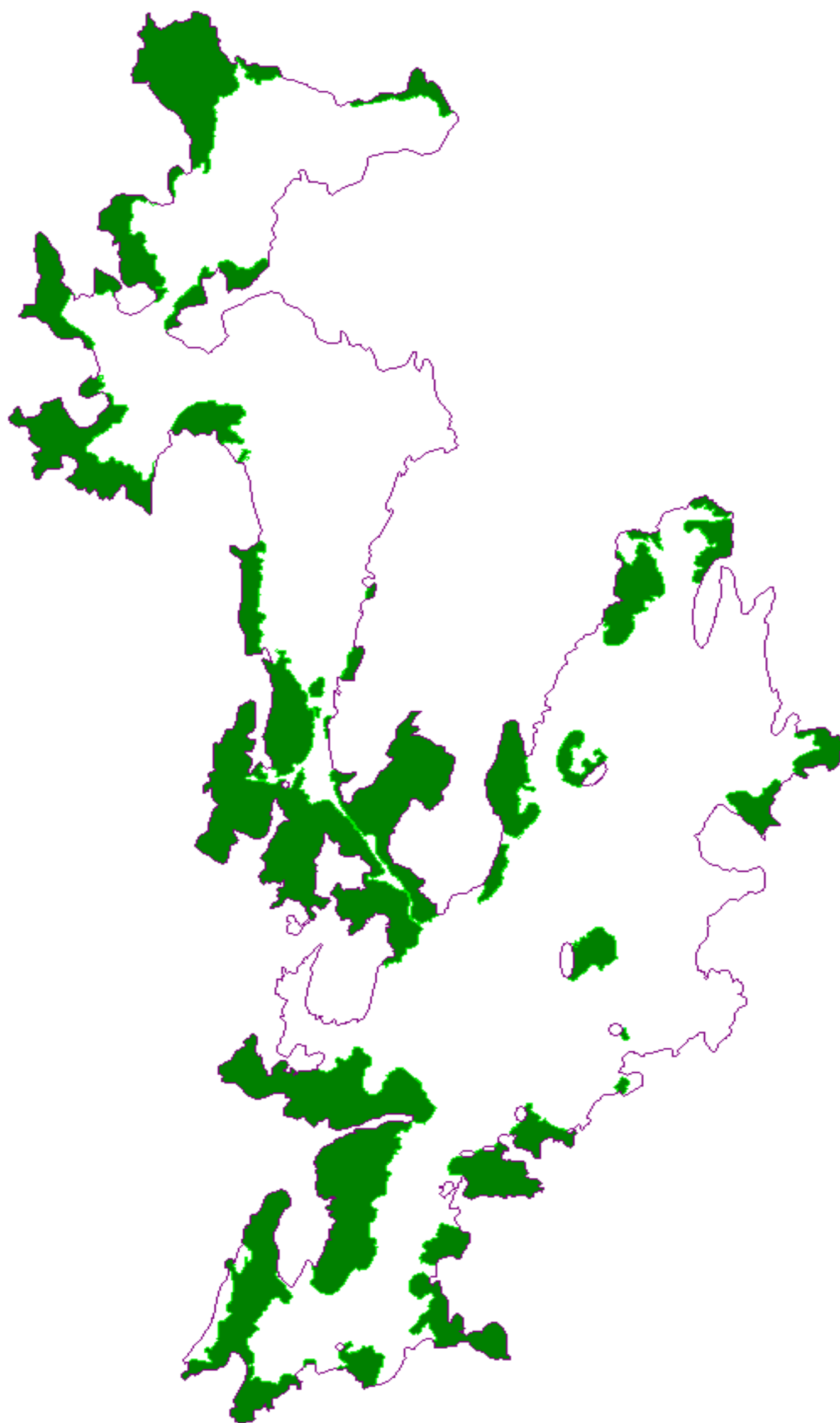
Maps.

The following three maps are:

1. The reedbeds as mapped in 2003.
2. The bulrush stands as mapped in 2007.
3. A scanned and enlarged copy of Shackleton's black and white map of 1975 (kindly provided by Chris Meehan).

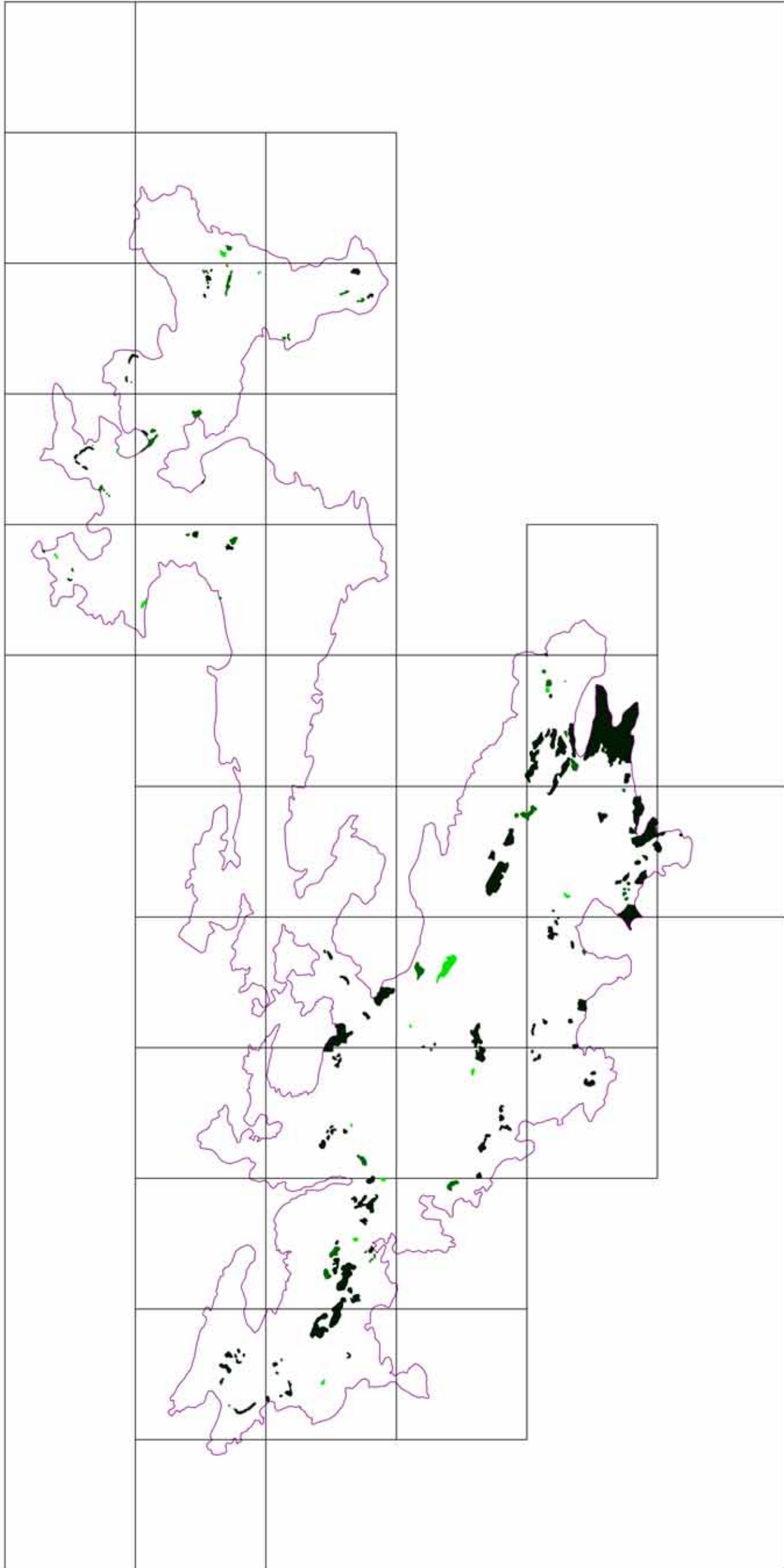
n.b. The colour map drawn by Shackleton on the six-inch OS map is not reproduced here, but is available in the NPWS office in Dublin.

REEDBEDS AS MAPPED IN 2003



BULRUSH STANDS AS MAPPED IN 2007

Bulrushes



SHACKLETON'S 1975 MAP ENLARGED AND ADAPTED

KEY  = Phragmites Reedbeds.
 = Scirpus lacustris Bulrush.

Northwest Basin

Castleburke

Burriscarra

Moorehall

Kilkeeran

Rinneen

Partry House Estate

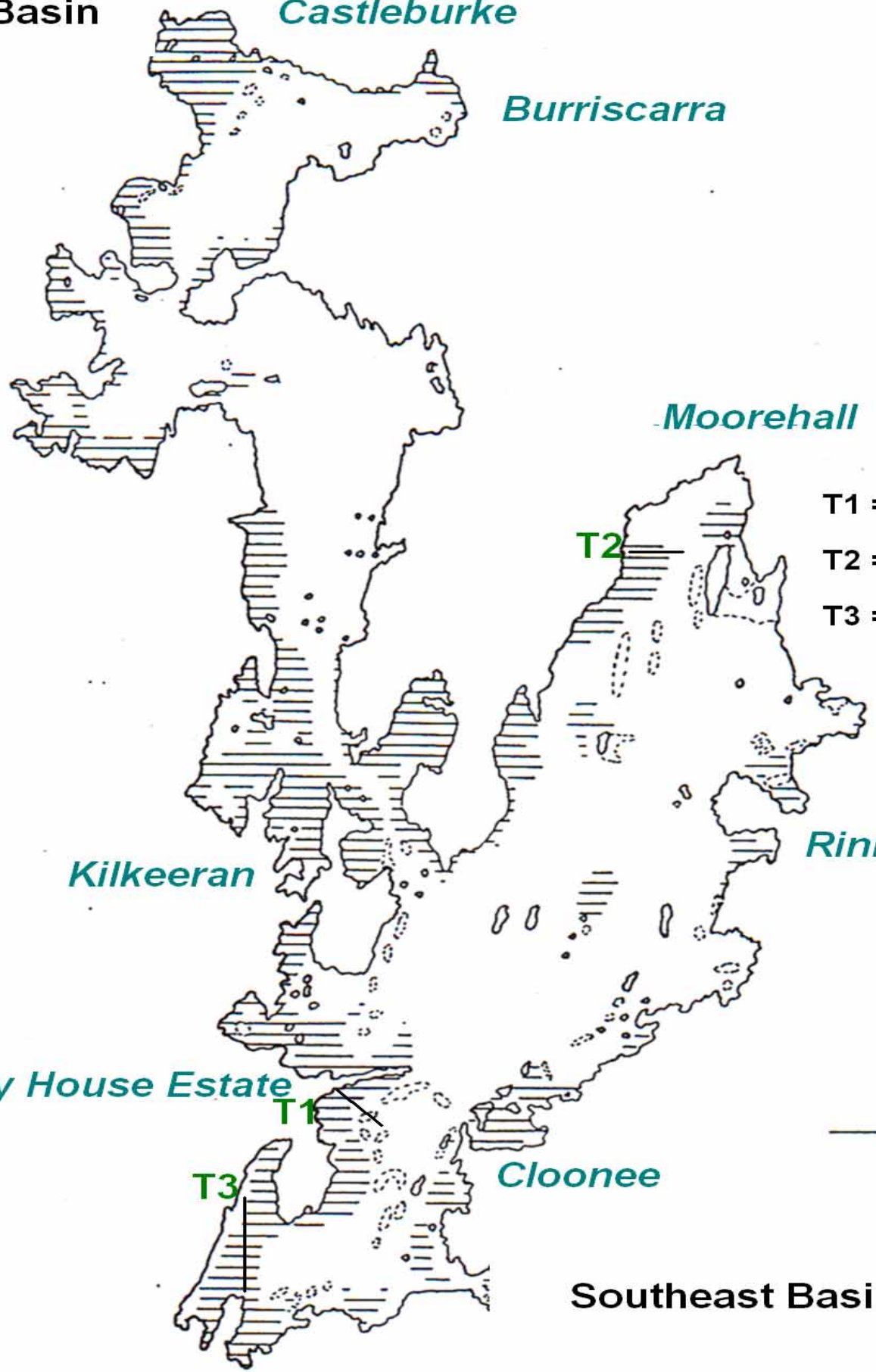
Cloonee

Southeast Basin



T1 = Transect 1.
T2 = Transect 2.
T3 = Transect 3.

1 Mile



The three arbitrary categories of bulrush stand density

