

**Final draft Minutes**  
**TMAP Salt Marsh Workshop**  
**Neuwerk 08 – 10 October 2003**

## **1 Opening and adoption of the agenda**

The chairman, Mr. Jan Bakker opened the meeting and welcomed the participants to the workshop, especially the participant Mr. Peter Körber from the Nationalparkverwaltung Hamburgisches Wattenmeer, who attended a salt marsh workshop for the first time. The meeting adopted the agenda as in **Annex 1**. A list of participants is in **Annex 2**. The meeting noticed with regret and concern that once again no delegate from Denmark attended the workshop. The meeting stressed that Danish participation is urgently needed for an assessment of the complete trilateral salt marsh areas and the production of the QSR Update 2004.

There were no comments on the minutes of the TMAP salt marsh workshop on Spiekeroog on May 14-16, 2003.

## **2 Presentations**

The delegates presented the results of the latest monitoring activities and informed the meeting about news concerning salt marshes in their country.

### **Lower Saxony**

Mr. Bunje gave an overview on artificial drainage in the salt marsh area of the Lower Saxon Wadden Sea. Artificial drainage systems are existing in a wide variety regarding distances and directions to each other, intensities, age and conditions on islands and the mainland and in different biotopes. Based on examples of aerial photographs, Mr. Bunje explained the difficulties to identify natural, near natural and artificial drainage. To get the year of the last maintenance of the drainage system is even more problematic. Nevertheless, a map of areas with and without drainage in the National Park was presented. In cooperation with the coastal protection authorities the National Park administration strives for reduction of the artificial drainage systems. Reduction measurements by reactivation of old gullies, remodeling ditches and closing main ditches have been carried out at the Leybucht. This kind of work is all the more necessary in order to establish more natural drainage systems, because artificial drainage systems have a very permanent character as shown pictures from Norderney demonstrated, where ditches, which had not been maintained in more than 20 years, could easily be identified. Therefore, sometimes a careful human support for natural drainage systems may be helpful for natural developments.

Mr. Bunje presented a second project, which gives information on the development of 'Vorländer', salt marshes, dunes and beaches by comparison of aerial pictures from 1966-68 and 1997. Aim of the project was the documentation of quantitative changes of these areas. The results are useful for the environment and coastal protection administrations.

The aerial pictures were evaluated regarding area and location of the specific types and the results stored in a GIS, where changes could be calculated. Salt marsh areas in Lower Saxony have increased by 2750 ha (but also 230 ha have been lost) since the end of the 1960s. The advantages of the used method are the simplicity, common criteria for the whole area of the Lower Saxony coast and the relatively low costs.

Mr. Hecker referred to biotype mapping in the National Park by airborne digital photograph flights in 2002 and 2003. Favorable conditions for data entry should preferably be e.g., a one-day flight between July and September, 3 hours around mid-tide, sunset below 30°, cloud coverage under 5% and a 32cm x 32cm/pixel resolution. Two flights with the camera system HRCS-AX in 2002 (Wursten, Budjadingen, islands) and one flight with the camera system DMC in 2003 (East Frisian coast, Jadebusen) have been carried out to cover the whole National Park.

Products were red, green, blue, infrared and panchromatic true orthophoto mosaics, digital surface models (DOM) and a project report. The approach allows for the direct and fast usage of the digital

photos geo-referenced in the GIS. With the high quality picture data including precise location, color and size, an automatic analysis and evaluation can be carried out and should fulfill reporting requirements of the TMAP and EU Habitat Directive in future. Mr. Hecker finished his presentation with a hypothetical sequence of analysis steps (classification, neighborhood analysis, vectorizing, elimination of small vectors) exemplary on pictures of a salt marsh area at the Wurster coast. The costs for the DMC solution is estimated from 200 €/sqkm for small and 28 €/sqkm for large areas.

### **Schleswig-Holstein**

Mr. Stock informed the meeting that the salt marsh mapping for 2001/2002 had been finished. The trilateral zonation has been successfully performed on data of the years 1989, 1996 and 2001. In November 2003, calculations on the basis of these data will be carried out to find out and assess the differences of the results of the three surveys. Maps will be soon available including the trilaterally agreed 25 vegetation types. The resulting salt marsh maps will also be required from the Environmental Ministry in Kiel. The publishing of the maps in a salt marsh book is planned until the end of 2004.

Mr. Stock reported about the good cooperation with the Dutch Meetkundige Dienst regarding intercomparison exercises of three salt marsh monitoring methods.

Three diploma theses on salt marshes are currently carried out concerning brent goose/vegetation, mapping of two areas of the Hamburger Hallig, and a study on methods dealing with sedimentation in the area of the Sönke-Nissen Koog.

### **The Netherlands**

In his presentation Mr. Dijkema showed that the area of salt marsh has constantly declined on the mainland (mostly in the Groninger Wadden Sea) for the last 400 years due to embankment activities, which could not be compensated by the increase of salt marshes on the islands. The about 20-year old cooperation between Rijkswaterstaat (RWS), Alterra and coastal farmers leads to the result that the farmers now realize more the natural management than the land reclamation management of salt marshes. Optimized groyne systems and even the reduction of artificial drainage systems will constitute stable salt marshes. In this context it is clear that increased sedimentation implies also succession of salt marsh vegetation to a climax and as consequence stands for the loss of the young succession salt marsh stages. The results of this more natural management has to be monitored in detail over the next 10 years.

The TMAP salt marsh zonation has been applied to sub-areas of the Dutch mainland and marshes. Data covering the last 15-20 years have been analyzed and a first assessment showed that each zonation class should be present with 10%-35% of the whole salt marsh area. The zonation data allows for an analyzing of aging of salt marshes. Different aging velocity is based on different sedimentation and also depends on occurrence of small herbivores like hares. Mr. Dijkema proposed an overview on aging of salt marshes in the Wadden Sea countries over the last 15-20 years, also in view of contributing new information to the QSR Update.

Mr. Kers informed the meeting that the name of the Meetkundige Dienst has been changed to 'Adviesdienst Geo-informatie'. At his institute, all salt marsh data are now stored in GIS with the required attributes and available for the TMAP. Changes in GIS methods now also allows the comparison of recent maps with old maps.

A general cut back of expenditure in monitoring programs in the Netherlands compromise especially the remote sensing monitoring. Also little projects have been cut down.

At the end Mr. Kers presented the 'Atlas van plantengemeenschappen in Nederland' by E.J. Weeda, which also covers the coastal vegetation.

### **Hamburg**

The lecture by Mr. Körber gave information about a compensation measure concerning the eastern part of the salt marshes on the island Neuwerk. In 1999, an altimetric survey to get exact information on contours of the island was carried out. Since 2001, this data has been used to calculate high tide information for the eastern salt marsh, which will be de-embanked by permanently opening the main sluice of the area in 2004. The aim is to stimulate and support a natural salt marsh development in this area. Additionally the system will be maintained by a duct system and the withdrawal of soil in some places. As possible problem the closeness of high tide water to the dike has been seen, but studies showed that the few high tides would not seriously compromise the main dike. As direct consequence of the higher vorland water the island drainage within the main dikes has to be improved.

Concerning the TMAP Mr. Körber expressed his opinion that he would be able to make the needed salt marsh of the National Park Hamburgisches Wattenmeer data available in time.

### **Denmark** (*status report by e-mail*)

The intended mapping of the Danish salt marshes in the 6 classes has not been performed, and it is in fact not realistic to expect such a detailed mapping in near future.

There will be 5 intensive and 12 extensive monitoring localities (20 - 50 ha) in the salt marshes of the counties Sønderjyllands and Ribe in the new national monitoring program NOVANA, which is going to be started in 2004. The intensive monitoring localities are going to be investigated every year from 2004 and onwards, and the extensive localities will be monitored every 6th year from 2004.

## **3 Salt Marsh Typology**

The salt marsh typology, of which the trilateral validity was nearly finalized at the last salt marsh workshop on Spiekeroog in May, has been discussed for a last time. In order to handle not identifiable and not specific salt marsh areas, the only for technical reasons chosen salt marsh zone 'No information about zone and vegetation type' has been introduced. On the more detailed level of vegetation types, but for similar reasons, for the zones 'Low marsh', 'High marsh' and 'Sandy, green beach' unspecific vegetation types have also been introduced.

The meeting agreed on the final version of salt marsh typology, as presented in ANNEX 3.

Specific colors for the attributes in a GIS and for presentations will be proposed by Mr. Kers and added to the typology table.

The typology key, which was available as draft version (also in ANNEX 3), will be checked and verified on the national level. Final comments can be made and sent to the secretariat by the end of October.

## **4 Preparation QSR Chapter**

The available draft version of the QSR Update on salt marshes was discussed. The chapters and content of the old draft version were rearranged to focus more on the update character of the QSR: After the introduction an overview on the status of the trilateral salt marshes will be given by tables on size of areas of the main salt marsh types, distribution of trilateral salt marsh zones on islands and mainland, and area information on drainage and land use (including maps).

Chapter three will deal with processes in natural developments (including definition on what is natural development), effects on succession (aging), land use and sea level rise as actual new information for the QSR Update. The finalizing perspectives of chapter three will be closely related to the EU Habitat Directive and Water Frame Directive.

Chapter four will present the results and consequences of the previous chapter regarding monitoring and probably new monitoring demands.

The last chapter will give recommendations and will set the results in relation to the trilateral targets.

The meeting agreed on the new structure and contents of the QSR Update salt marsh chapter as presented in ANNEX 5.

## **5 Planning Salt Marsh Book**

Because of no new information about possible publisher and financing of the salt marsh book this agenda item has been postponed to the next meeting.

## **6 Follow up and Closing**

The next meeting of the salt marsh experts will be a **QSR Update meeting**, which will be held at the secretariat in Wilhelmshaven in **February 2, 2004 (11:00h)**. The next regular salt marsh workshop will be carried out in May 2004. Date and location will be fixed at the QSR meeting in Wilhelmshaven.

The chairman expressed his gratefulness that the participants gave so much valuable input to the workshop and closed meeting.

Wilhelmshaven October 2003

**ANNEXES**

- ANNEX 1 Agenda
- ANNEX 2 List of participants
- ANNEX 3 TMAP Vegetation typology (final version, October 10, 2003)  
including typology key (draft version, October 10, 2003)
- ANNEX 4 Long-term study sites
- ANNEX 5 Structure of the QSR Update chapter: Salt marshes (status October 10, 2003)
- ANNEX 6 Discussion on mapping methods

**ANNEX 1****TMAP Salt Marsh Workshop 2003  
8 - 10 October 2003, Neuwerk, Germany****Proposed Draft Agenda  
(24 September 2003)****8 October 2003:****17:45 Departure Cuxhaven-Sahlenburg (by carriage)****19:00 Arrival on Neuwerk****9 October 2003:****9:00 – 12:30 First Session****1 Opening and adoption of the agenda****2 Presentations**

All participants are invited to a short presentation (about 10 - 15 min.) of the recent results of the running monitoring programs in the Netherlands, Lower Saxony, Schleswig-Holstein and Denmark and to report about relevant projects and developments.

**3 Salt Marsh Typology**

- Finalization of the classification key.
- Results of the salt marsh classification and status of data delivery and compilation (trilateral GIS maps on salt marsh zonation, drainage).

**12:30 – 13:30 Lunch****13:30 – 16:30 Second Session****4 Preparation QSR Chapter**

- Discussion of the QSR outline and inclusion of national contributions into the QSR.
- Planning of the first draft of the chapter to be delivered by 1 November 2003.
- Finalization of an overview of long term monitoring sites.

**16:30 – 18:30: Salt marsh excursion (optional on 10<sup>th</sup> October 12:00 – 14:00)****19:30: Dinner****10 October 2003:****9:00 – 12:00: Third Session****5 Planning Salt Marsh Book**

- Preparation of a trilateral salt marsh book.

**8 Follow up and Closing****14:30 Departure Ferry**

## ANNEX 2

**TMAP Salt Marsh Workshop, Spiekeroog, 14 –16 May 2003**  
**List of participants**

<p><b>Mr. Jan P. Bakker (chairman)</b>  Rijksuniversiteit Groningen  Biologisch Centrum  Postbus 14  NL – 9750 Haren  phone +31 (0)50 363 2221  fax +31 (0)50 363 2273  j.p.bakker@biol.rug.nl</p>	<p><b>Mr. Kees S. Dijkema</b>  Alterra  Postbus 167  NL - 1790 AD Den Burg/Texel  phone: +31 (0)222 369714  fax: +31 (0)222 319235  e-mail: k.s.dijkema@alterra.wag-ur.nl</p>
<p><b>Mr. Bas Kers</b>  Rijkswaterstaat  Meetkundige Dienst  Postbus 5023  NL - 2600 GA Delft  phone: +31(0)15 269 1460  fax: +31(0)15 213 54 56  e-mail: a.s.kers@mdi.rws.minvenw.nl</p>	<p><b>Mr. Martin Stock</b>  Landesamt für den Nationalpark Schleswig-Holsteinisches Wattenmeer  Schloßgarten 1  D - 25832 Tönning  phone: +49 (0)4861 616 47  fax: +49 (0)48 61 616 69  e-mail: stock@nationalparkamt.de</p>
<p><b>Mr. Norbert Hecker</b>  Nationalparkverwaltung Nds. Wattenmeer  Virchowstr. 1  D - 26382 Wilhelmshaven  phone: +49 (0)4421 911296  fax: +49 (0)4421 911280  Norbert.Hecker@br-we.niedersachsen.de</p>	<p><b>Mr. Jürn Bunje</b>  Nationalparkverwaltung Nds. Wattenmeer  Virchowstr. 1  D - 26382 Wilhelmshaven  phone: +49 (0)4421 911289  fax: +49 (0)4421 911280  juern.bunje@br-we.niedersachsen.de</p>
<p><b>Mr. Peter Körber</b>  Nationalparkverwaltung Hamburgisches Wattenmeer  Billstraße 84  D - 20539 Hamburg  phone: +49 (0)40 42845 21??  fax: +49 (0)40 42845 2579  peter.koerber@bug.hamburg.de</p>	<p><b>Mr. Gerold Luerßen</b>  Common Wadden Sea Secretariat  Virchowstr. 1  D. 26382 Wilhelmshaven  phone: +49 (0) 4421 9108 15 / 16  fax: +49 (0) 4421 9108 30  luerssen@ waddensea-secretariat.org</p>

## ANNEX 3

TMAP salt marsh typology (legend) final version October 10, 2003

TMAP-Code	Name
0	No information about zone and vegetation type
0.0	Salt marsh, unspecific
1	Pioneer Zone
1.0	Pionier Zone, unspecific
1.1	<i>Spartina anglica</i> / <i>Spartina maritima</i> type
1.2	<i>Salicornia europaea</i> / <i>Salicornia procumbens</i> / <i>Salicornia stricta</i> / <i>Suaeda maritima</i> / <i>Bassia hirsuta</i> type
2	Low Marsh
2.0	Low Marsh, unspecific
2.1	<i>Puccinellia maritima</i> / <i>Puccinellia distans</i> type
2.2	<i>Limonium vulgare</i> / <i>Puccinellia maritima</i> type
2.3	<i>Aster tripolium</i> / <i>Puccinellia maritima</i> type
2.4	<i>Atriplex portulacoides</i> / <i>Puccinellia maritima</i> type
3	High marsh
3.0	High Marsh, unspecific
3.1	<i>Limonium vulgare</i> / <i>Juncus gerardi</i> type
3.2	<i>Juncus gerardi</i> / <i>Glaux maritima</i> type
3.3	<i>Festuca rubra</i> type
3.4	<i>Atriplex portulacoides</i> / <i>Artemisia maritima</i> type
3.5	<i>Artemisia maritima</i> / <i>Festuca rubra</i> type
3.6	<i>Juncus maritimus</i> / <i>Festuca rubra</i> / <i>Juncus gerardi</i> type
3.7	<i>Elytrigea atherica</i> type
3.8	<i>Carex extensa</i> type
3.9	<i>Atriplex prostrata</i> / <i>Atriplex littoralis</i> type
3.10	<i>Agrostis stolonifera</i> / <i>Trifolium fragiferum</i> type
3.11	<i>Plantago coronopus</i> / <i>Sagina maritima</i> & <i>nodosa</i> / <i>Centaurium littorale</i> type
3.12	<i>Ononis spinosa</i> / <i>Carex distans</i> type
3.13	<i>Elytrigea repens</i> type
4	Sandy, green beach
4.0	Sandy, green Beach, unspecific
4.1	<i>Elytrigea juncea</i> / <i>Glaux</i> , <i>Agrostis</i> , <i>Atriplex pedunculata</i> / <i>Honckenya peploides</i> , <i>Salsola kali</i> ssp. <i>kali</i> , <i>Cakile maritima</i> type
5	Brackish marsh
5.0	Brackish marsh, unspecific
5.1	<i>Bolboschoenus</i> + <i>Schoenoplectus</i> type
5.2	<i>Phragmites australis</i> type
5.3	<i>Blysmus rufus</i> / <i>Agrostis</i> / <i>Potentilla</i> / <i>Trigl mar</i> / <i>Cotula</i> / <i>Festuca aru</i> / <i>Elytrigea repens</i> / <i>Eleocharis uniglumis</i> type
5.4	<i>Juncus maritimus</i> / <i>Oenanthe lachenalii</i> type
6	Fresh (anthropogenic) grassland
6.0	Fresh (anthropogenic) vegetation, unspecific
6.1	<i>Lolium perenne</i> , <i>Cynosurus cristatus</i> and other fresh (anthropogenic) grasslands

total: 25 specific and 7 unspecific types

**Salt/brackish water species (W)**

*Zostera marina*, *Zostera noltii*, *Ruppia maritima*, *Ruppia cirrhosa*, *Zanichellia palustris* s.l., *Potamogeton pectinatus*.

**Pioneer species (P)**

*Spartina anglica* & *maritima*, *Salicornia europaea*, *procumbens* & *stricta*, *Suaeda maritima*, *Bassia hirsuta*.

**Species of the low marsh (L)**

*Puccinellia maritima*, *Atriplex portulacoides*, *Cochlearia anglica*, *Aster tripolium*, *Spergularia maritima* & *salina*, *Triglochin maritima*, *Limonium vulgare*, *Plantago maritima*, *Parapholis strigosa*, *Atriplex pedunculata*.

**Species of the high marsh (H)**

*Artemisia maritima*, *Armeria maritima*, *Juncus gerardi*, *Glaux maritima*, *Agrostis stolonifera*, *Festuca rubra*, *Elytrigea atherica*,  
*Juncus maritimus*, *Potentilla anserina*, *Trifolium fragiferum*, *pratense* & *repens*, *Poa pratensis*, *Lolium perenne*,  
*Plantago coronopus*, *Sagina maritima* & *nodosa*, *Carex extensa*, *Carex distans*, *Ononis spinosa*,  
*Hordeum secalinum*  
*Leontodon autumnalis* & *saxatilis*, *Lotus corniculatus* & *glaber*, *Centaureum pulchellum* & *littorale*,  
*Cochlearia danica*,  
*Odontites vernus* ssp. *serotinus*, *Cerastium fontanum* ssp. *Vulgare*, *Bupleurum tenuissimum*, *Hordeum marinum*,

**Species of the brackish marsh (B)**

*Phragmites australis*, *Bolboschoenus maritimus*, *Schoenoplectus tabernaemontani*, *Blysmus rufus*,  
*Agrostis stolonifera*, *Eleocharis uniglumis*, *Triglochin palustris*, *Cotula coronopifolia*, *Potentilla anserina*,  
*Juncus maritimus*, *Oenanthe lachenalii*, *Trifolium repens* & *fragiferum*, *Festuca arundinacea*, *Elytrigea repens*,  
*Leontodon autumnalis*, *Alopecurus geniculatus*, *Ranunculus sceleratus*, *Centaureum pulchellum*.  
*Juncus ambiguus*, *articulatus* & *bufonius*, *Chenopodium rubrum* & *glaucum*.

**Species of sandy green beaches (S)**

*Elytrigea juncea*, *Honckenya peploides*, *Salsola kali* ssp. *kali*, *Cakile maritima*.

**Species of fresh anthropogenic grasslands (F)**

*Lolium perenne*, *Poa annua*, *Cynosurus cristatus*, *Bellis perennis*, *Taraxacum* sect. *Vulgaria*, *Plantago major*,  
*Poa trivialis*, *Elytrigea repens*, *Capsella bursa-pastoris*, *Polygonum aviculare*, *Cirsium arvense*, *Rumex obtusifolius*.

When other TMAP-headzones will be used on the map, an opportunity can be that all salt marsh codes starts with an "S" (in comparison with the dunes ("D" e.d. etc.).

This is also the reason that the headzone 'dunes and beach ridges' (e.d.) will not be in the salt marsh typology.

Vegetation complex:

- 1 zone: dominant type for the whole area
- 2 zones: 50/50% -> lowest zone type
- 3 zones: middle zone dominant type

## Typology key (draft version October 10, 2003)

abundance < 5% = bare soil

### Dominance group:

Phrag aus > 50%  
 Atrip por > 50%  
 Aster tri > 50%  
 Elytri ath > 50%  
 Atrip pro + Atrip lit > 50%  
 Spart ang > 50%  
 Bolbo mar + Schoe tab > 50%  
 Limon vul > 25% and grasses1) < 25%  
 Suaed mar > 25%, and Suaed mar highest abundance of group 1  
 Elytri ath + Atrip pro > 25% e), and Elytri ath highest abundance of group 1  
 Atrip lit > 25%, and Atrip lit highest abundance of group 1  
 Pucci dis + Sperg sal  $\geq$  10%, and both species are present  
 Carex ext > 5%  
 Blysm ruf  $\geq$  10% or Blysm ruf > 5% and Carex ext > 1% & Centm pul + Odont ver are both present  
 Sagin mar + Cochl dan + Buple ten + Plant cor > 5% and >2 species  
 or Centm lit + Sagin nod + Leont sax >2 species present  
 Glaux mar + Agrossto > 5 % and the only species (on sandy places)  
 Ononispi + Carex dis  $\geq$  5% and Ononi spi is present  
 Agros sto  $\geq$  5% and group 22)  $\geq$  4 species  
 Aster tri > 25% and grasses < 15% and Aster tri highest abundance of group 34)  
 Trigl mar > 25% and grasses < 15% and Trigl mar highest abundance of group 34)  
 Bolbo mar + Schoe tab > 25% and Bolbo mar + Schoe tab highest abundance of group 34)  
 Phrag aus > 25% and Phrag aus highest abundance of group 34)  
 Agros sto > 25% and Juncu ger < 5% and Festu rub  $\leq$  15% and Pucci mar < 25% and  
 group high salt marsh (H) + Ranun sce + Alope gen + Cotul cor  $\geq$  1 present and group H < 50%.

Zonation:

**Pioneer Zone** (cover > 5% a) ; P species > W + L + higher species

Spart ang + Spart mar > Salicornia spp. + Suaed mar + Bassi hir  
 Salicornia spp. + Suaed mar + Bassi hir > Spart ang + Spart mar b)  
 rest

**Low Marsh** (W + P species < L1 species > M + higher species)

Limon vul > 15% and highest abundance of group 45)  
 Atrip por > 20% c) and highest abundance of group 45)  
 Aster tri > 15% and highest abundance of group 45)  
 Puccimar > 5%  
 rest

**High marsh** (W + P + L1 + L2 + B species < M (- Agros sto & Festu rub) + H species)

Artem mar > 15% and Artem mar > Festurub  
 Atrip por > 15% and highest abundance of group 45)  
 Juncu mar > 15%  
 Limon vul > 10% and Limon vul > Armer mar  
 Juncu ger > 35% d) and Juncu ger > Festu rub  
 Festu rub > 35% and Festu rub > Juncu ger  
 Glaux mar > 25% and grasses < 15%  
 Elytr rep > 25% and H species > 0 and H species  $\geq$  L2 + M species  
 Festu rub > 15% and Agros sto + Poten ans present and H species > 0 and H species  $\geq$  L2 + M  
 species  
 High Marsh, unspecific

**Sandy, green beach** (S species (- Agros sto + Glaux mar) > W + P + L + M + B + H species)

Elytr jun + Honck pep + Salso kal + Cakil mar  $\geq$  5%

...or (P species < L1 species > M + higher species) and Parap str + Elytr jun + Agros sto + Atrip ped >= 5% and >= 2 species  
rest

**Brackish marsh** (B species > W + P + L + M + H species)

Juncu mar + Oenan lac >= 10% and Juncu mar present

Festu aru > 10%

...or Poten ans > 25%

...or Elytr rep > 25% and groepbr present

Brackish marsh, unspecified

**Fresh (anthropogenic) grassland**

Loliu per + Cynos cri + Poa annua + Poa triv + Plant maj + Polyg avi > 25%

Fresh (anthropogenic) vegetation, unspecified

**No information about zone and vegetation type**

Salt marsh / green beach, unspecified

## ANNEX 4

## Long-term study sites (version October 10, 2003)

## 1 Aging / succession

	Method	Site	Morphological type		Starting
<b>Sedimentation:</b>	SEB	mainland (NL)	foreland	clay	1993
	SEB	Ameland (NL)	Barrier connected	sand	1993
	SEB	Schiermonnikoog (NL)	Barrier connected	sand	1997
	SEB	Terschelling (NL)	Barrier connected	sand	1997
	SEB	mainland coast SH (DE)	foreland	clay	2001
	SEB	Hamburger Hallig SH (DE)	foreland	clay	1991
	FAR	Hallig Nordstrandischmoor, Hooge, Gröde SH (DE)	Barrier connected	clay	1991
	SET	Sonke-Nissen-Koog SH (DE)	foreland	clay	1988
	SET	Friedrichskoog SH (DE)	foreland	clay	1988
	gravel	Skallingen (DK)	Barrier connected	sand	1938
	levelling	mainland (NL)	foreland	clay	1960
		Schiermonnikoog (NL)	Barrier connected	sand	1992
		Dollart (NL)	Estuarine	clay	1984
		mainland coast SH (DE)	foreland	clay	2001
		mainland LS (DE)	foreland	clay	1964
	PQ	mainland Groningen (NL)	foreland	clay	1960
	PQ	mainland Friesland (NL)	foreland	clay	1960
	PQ	Terschelling (NL)	Barrier connected	sand	1973
	PQ	Schiermonnikoog (NL)	Barrier connected	sand	1992
	PQ	Rottumerplaat (NL)	Barrier connected	sand	1998
	PQ	Rottumeroog (NL)	Barrier connected	sand	1998
	PQ	mainland LS (DE)	foreland	clay	Sabine
	PQ	Neuwerk HH (DE)	Barrier connected	sand	2000
	PQ	Nigehörn HH (DE)	Barrier connected	sand	2001
	PQ	Scharhörn HH (DE)	Barrier connected	sand	2002
	PQ	mainland SH (DE)	foreland	clay	1997
	PQ	Hamburger Hallig SH (DE)	foreland	clay	1991
	PQ	Hallig Nordstrandischmoor, Hooge, Gröde SH (DE)	Barrier connected	clay	1991
	PQ	Trischen SH (DE)	Barrier connected	sand	2002
	PQ	Westerhever SH (DE)	foreland	clay	1991
	PQ	Ribe / .. county (DK)	foreland	clay	2004

Methods: SEB = sedimentation/erosion bar  
 SET = sedimentation/erosion table  
 FAR = Frequenzanalyserahmen  
 PQ = Permanent plots

## 2 Area increase / coastal protection

	Method	Site	Morphological type		Starting
<b>De-embankement:</b>		Noord-Friesland (NL)	foreland	clay	2002
		Paesumerlannen (NL)	foreland	clay	1973
		Langeoog (DE)	barrier connected	sand	2004
		Hauenerhooge (DE)	foreland	clay	1994
		Wurster Kuste (DE)	foreland	clay	2004
		Neuwerk (DE)	foreland	clay	2004

### 3 Revitalisation

	Method	Site	Morphological type		Starting
<b>Drainage:</b>		mainland coast Friesland (NL)	foreland	clay	1960
		mainland coast Groningen (NL)	foreland	clay	1960
		mainland SH (DE)	foreland	clay	1995
		Neuwerk	barrier connected	sand	2004
		Hauenerhooge (DE)	foreland	clay	1994
		Langeoog summerpolder (DE)	barrier connected	sand	2001
		Norderland summerpolder (DE)	foreland	clay	2004
		Denmark	foreland	clay	John
<b>Creek damming experiment:</b>		Holwert (NL)	foreland	clay	1997
		Norderney (DE)	barrier connected	sand	2003
<b>Clay pits:</b>		Jadebusen (DE)	foreland	clay	1990
		Elisabeth Aussengroden (DE)	foreland	clay	1990


### 4 Sea level rise

	Method	Site	Morphological type		Starting
<b>Subsidence experiments:</b>		Ameland (NL)	barrier connected	sand	1986
<b>Tidal inundation:</b>		Norderney (DE)	barrier connected	sand	2000
		DK ?			John

### 5 Management / landuse

	Method	Site	Morphological type		Starting
<b>Grazing:</b>		mainland coast Friesland (NL)	foreland	clay	1960
		mainland coast Groningen (NL)	foreland	clay	1960
		Dollard (NL)	foreland	clay	1980
		Schiermonnikoog (NL)	barrier connected	sand	1972
		Terschelling (NL)	barrier connected	sand	1975
		Sonke-Nissen-Koog (DE)	foreland	clay	1988
		Friedrichskoog (DE)	foreland	clay	1988
		Hamburger Hallig (DE)	Hallig	clay	1991
		Hallig Nordstrandischmoor, Hooge, Gröde SH	Hallig	clay	1991
		Buscherheller / Leybucht (DE)	foreland	clay	1995
		Skallingen (DK)	barrier connected	sand	1995
	<b>Cutting:</b>		Jadebusen (DE)	foreland	clay
		Elisabeth Aussengroden (DE)	foreland	clay	1990
		Ho Bugt (DK)	foreland	clay	John

To be added: Map with location and type of long term study site (CWSS)

 has to be filled in

**ANNEX 5**

Structure of the QSR Update chapter: Salt marshes (status October 10, 2003)

**1. Introduction**

(0,5p) CWSS

Summary of outcome QSR99

TMAP as foundation for EU Habitat Directive and WFD

**2. Status**

(2p) CWSS, Martin, Bas, Jörn, Peter, Norbert, DK?

2.1 Total areas of main salt marsh types according to the QSR99 (table 5.7).

Salt marsh type	Denmark	Schleswig-Holstein	Hamburg	Nieder-sachsen	The Netherlands
1. Barrier islands					
a. barrier connected					
b. green beaches*					
c. foreland					
d. summer polder					
e. de-embanked summer polder					
2. Mainland					
a1. mainland marsh					
a2. summer polder					
a3. de-embanked summer polder					
3. Halligen					
<b>Total</b>					
<b>Total QSR99</b>					

\*to make data from green beaches from zonation type data available as geomorphological data, these areas have to be calculated with beach areas data, which cover green beaches

2.2 Zonation

Map of Wadden Sea Area with distribution of zones on main land, islands and the Halligen for each countries.

Table of vegetation types (Bas).

2.3 Drainage (in ha)

Salt marsh type	Denmark			Schleswig-Holstein			Hamburg			Nieder-sachsen			The Netherlands		
1. Barrier islands	a.	b.	c.												
2. Mainland															
3. Halligen															

Criteria

- a. no artificial drainage at all (column a.)
- b. last year of artificial drainage (column b.)
- c. regular ongoing artificial drainage measures (every 2or 3 years) (column c.)

Pictures

Aerial pictures of typical drainage in a., b., c.

2.4 Land use  
(in ha)

Salt marsh type	Denmark				Schleswig-Holstein				Hamburg				Nieder-sachsen				The Netherlands			
	a.	b.	c.	d.																
1. Barrier islands																				
a. barrier connected																				
b. green beaches*																				
c. foreland																				
d. summerpolder																				
e. de-embanked summerpolder																				
2. Mainland																				
a1. mainland marsh																				
a2. summerpolder																				
a3. de-embanked summerpolder																				
3. Halligen																				
<b>Total</b>																				
<b>Total QSR99</b>																				

Criteria:

- a. no land use (column a.)
- b. grazing moderate(diverse canopy height) (column b.)
- c. grazing intensive(100% short canopy) (column c.)
- d. cutting (column d.)

**3. Processes**

(2p) Jan, Martin, Kees, Jörn, Norbert, Peter, DK?

3.1 Natural development?

(trilateral targets)

Natural development of salt marshes

Semi-natural development

- by stopping land use and drainage
- by sedimentation fields with groynes and without drainage
- de-embankment

drainage	sedimentation	land use	type of landscape
creeks	no groynes	no	natural
creeks	no groynes	grazing/cutting	semi-natural
clay pits with creeks	no groynes	no	assisted natural
creeks	groynes	no	assisted natural
creeks	groynes	no	semi-natural
ditches	groynes	grazing/cutting/abandoning	semi-natural

3.2 Effects on succession: Aging

(old text will be revised, only descriptive)

3.3 Effects of land use on succession

(old text will be revised, only descriptive)

3.4 Effects of sea level rise

Kees

3.5 Perspectives (-> needs for monitoring, in relation to EU habitat and Water Frame Directive)

#### **4. Monitoring in relation to trilateral targets**

(1p) Jan, Kees

Table of long term study sites in the countries.

Map with 5 study site types and numbers of long term study sites.

#### **5. Conclusion**

(0,5p)

Recommendations

in relation to trilateral targets

**ANNEX 6**

Discussion on mapping methods (Participants: Martin Stock, Norbert Hecker, Peter Körber, Jörn Bunje, Bas Kers)  
(This discussion took place beside the salt marsh workshop)

Netherlands, Hamburg und Schleswig-Holstein are mapping salt marshes by aerial photos (more detailed information on these methods can be found in the previous salt marsh reports), Lower Saxony is doing its mapping by digital remote sensing. The question raised whether Lower Saxony can map the 25 TMAP vegetation types with the remote sensing method of a "Supervised classification" combined with fieldwork.

Probably the zonation derived from both methods will be the same. But to validate the results of both methods concerning the TMAP vegetation typology, results, respectively maps, of the same area and the same year are needed and have to be compared.

This task is done by Nature Consult (Jörg Petersen). The results of this comparison will be available at the end of November. When both methods get the same result there will be no problem to use the aerial photo and also the digital remote sensing method.

In case of that the results are different the status of the TMAP salt marsh typology data can not be directly compared. An other important aspect are the costs of each method. At the end of the year Martin and Norbert (then with the method comparison results of Nature Consult) will make an overview on the costs of both methods.