ROY COOPER
Governor
ELIZABETH S. BISER
Secretary
TANCRED MILLER
Director

NORTH CAROLINA
Environmental Quality

CRC-24-07

April 9, 2024

MEMORANDUM

TO: Coastal Resources Commission
FROM: Heather Coats, Beach & Inlet Management Project Coordinator
SUBJECT: Addition of Rule Language to Allow the Installation and Maintenance of Straw Bales

Rules associated with the use of sand fencing were originally adopted in 2002 as a dune building or dune protection measure through the process of trapping wind-blown sand. The rules for sand fencing include both an exemption (15A NCAC 07K .0212) for its use subject to specific conditions, and a permit process (15A NCAC 07H .0311) for proposed projects that did not meet the exemption criteria. Since then, the use of sand fencing has become more widespread along our coast as it expanded from small-scale projects at individual properties to large-scale town-wide projects that can span miles. As its use has grown in scope and scale, increasing concerns have been raised regarding storm debris and safety risks of dilapidated and damaged wooden sand fencing.

In 2015, the idea of using hay and straw bales was raised as a natural and biodegradable alternative to wooden sand fencing for reducing debris and risks of derelict sand fencing. A CAMA Minor Permit was issued to two properties in Figure 8 Island to serve as a "pilot study". More information about the history of sand fencing and hay and straw bales can be found in the attached January 2022 memo (Attachment A), including pros and cons regarding the use of hay or straw bales in place of traditional wooden sand fencing. At your February 2022 meeting, staff recommended that the current minor permit process be maintained to allow for additional information to be gathered to assess their efficacy and impacts, as long as the projects are consistent with the exemption criteria for sand fencing. Additionally, in accordance with requests made by the US Fish and Wildlife Service (USFWS) and NC Wildlife Resources Commission (NCWRC), staff recommended that bales used as sand fencing be free of binding to reduce the potential for entrapment of nesting shorebirds or turtles, and that the applicant agree to provide photographs and a brief description of the status of the material after installation.

At your February 2023 meeting, you heard a variance request from the Town of Ocean Isle Beach. Due to troubles sourcing traditional sand fencing, the Town proposed the use of hay bales and pine straw bales as a sand fencing alternative at several public beach accessways. The minor permit application for the use of hay and pine straw bales proposed to comply with the siting and configuration requirements of the sand fencing exemption, specifically: that sections of the bales would be limited to 10' in length and no more than 10' waterward of the toe of dune with a minimum spacing of 7' between bales and a height limited to one bale. During application review, concerns were expressed by both the USFWS and the NCWRC due to the lack of data regarding potential adverse impacts. Specifically, the NCWRC stated:

"The direct, secondary, and cumulative impacts bales may have on these resources coast wide is unknown and should be discussed in more detail prior to the inclusion of bales as a management tool by the NCDCM. No information has been found regarding bale use on ocean shorelines in other states, so previously studied examples cannot be compared. Therefore, we request additional conversation occur between the NCDCM, NCWRC, and United States Fish and Wildlife Service (USFWS) to discuss impacts bales may have in the immediate area of installation, the cumulative impact they may have on repeat installations in the same area, the cumulative impact they may have on habitats with coast wide use, and the regulation of use if determined to be an appropriate tool. These discussions should occur prior to the issuance of any permits or allowances of bales on ocean shorelines."

The USFWS also indicated they generally concurred with the concerns of the NCWRC and specifically cited concern regarding the potential for introduction of invasive species when using hay or pine straw bales (via plant seeds and/or insect eggs within the bales, potential for changes in pH (especially with the use of pine straw), and the potential for rapid decomposition and introduction of excessive nutrients and plant material into the surrounding area and waters. As a result, the permit application was denied and the Town applied for a variance from the Coastal Resources Commission. The Town also committed to removing the material that bound the bales at installation, to post signs at the project areas indicating to the public that it was a pilot project, and to monitor the project area and submit monthly monitoring reports to the DCM. The variance was granted with the additional condition that the Town consult with USFWS and NCWRC along with other experts to discuss best practices and appropriate monitoring protocols. It was made clear that this consultation was non-binding and a virtual call was held on March 3, 2023 with the respective parties, including representatives from the NCWRC and USFWS, Dr. Zac Long with the University of North Carolina at Wilmington (UNCW) and Steve Mercer with Coastal Transplants.

As a result of the March 3, 2023 meeting, the Town agreed to use straw bales instead of hay and UNCW agreed to conduct temperature, pH and moisture monitoring. The straw bales were installed on May 10, 2023 at six public accessways. In late September 2023, UNCW began their monitoring of the hay bales. In their early monitoring reports regarding structural status of the straw bales, the Town indicated they were pleased with initial results as some of the bales were becoming covered with sand. The Town reported that the straw bales remained intact after Hurricane Idalia in September 2023, with little water intrusion, and the bales that had become covered with sand remained covered after the storm. They also reported there was little wave runup associated with the storm. In November 2024, the Town reported that the bales remained intact and most were covered with sand. Maria Dunn with the NCWRC conducted an independent site visit on November 7, 2023 and sent an email in response conveying concern that some of the bales had become depressed in height and degraded. Ms. Dunn stated that there were additional bales placed landward of the frontal dune that were outside the approved project area and requested their removal. She also requested results from the temperature monitoring being conducted by UNCW.

The Town responded that after investigation, they believed some of the bales had become depressed from people sitting on them (if uncovered) or walking over them once they became covered, and suggested increasing the height of bales to two high as a potentially better design. They also stated that the additional straw bales outside of the project area were not installed by the Town and that they would contact the property owners to request removal. The Town also agreed to contact Dr. Long to ask for preliminary results from the temperature monitoring (Attachment B). In December 2023, a storm event occurred, and the Town reported the island experienced minor erosion as a result of the storm and higher than average tides. They reported that the uncovered bales at two sites were completely absent post-storm and some of the bales that were partially or fully covered were damaged, but others remained intact with

sand still covering a majority of the remaining bales. In January 2024, the Town reported a second storm event in December 2023 washed away bales at three additional sites and straw bales only remained at one site (E. Third Street). They reported that although the bales washed away in the storms, they left no remains or debris on the beach. They also inquired about replacing the bales, as they believed they were proving effective prior to the storm (Attachment C).

In recent communications with Dr. Zac Long at UNCW, he relayed that they are still analyzing data collected in the fall 2023 and more recently in the spring 2024. Nine temperature loggers were placed at two of the straw bale sites for a period of approximately one month from late September to late October 2023. Sand samples were also taken at the Third Street site recently where some straw bales remain to assess pH and moisture content. These data have not yet been processed for review. Dr. Long also indicated they plan to reinitiate monitoring of the straw bales if replaced and they will be able to develop a more comprehensive sampling protocol than what has been collected to date.

Staff developed draft rule language at the direction of the Commission, which can be found in Attachment D. This draft language closely mirrors conditions for the use of sand fencing but would also require a minor permit and DCM coordination with USFWS and WRC. USFWS and NCWRC have indicated that their concerns regarding the use of straw bales will remain until they can more fully evaluate data collected in the Ocean Isle Beach pilot project to better assess the potential impacts of their widespread use.

We look forward to discussing this information at your April 2024 meeting.

ATTACHMENT A: 2022 MEMO TO CRC REGARDING PROPOSED AMENDMENTS TO 15A 7K .0212- INSTALLATION & MATINENANCE OF SAND FENCING

ATTACHMENT B: EMAIL CORRESPONDENCE BETWEEN THE TOWN AND NCWRC REGARDING MONITORING RESULTS

ATTACHMENT C: EMAIL CORRESPONDENCE- JANUARY 2024 MONITORING REPORT

ATTACHMENT D: PROPOSED RULE LANGUAGE TO SPECIFICALLY ALLOW FOR THE USE OF STRAW BALES

ATTACHMENT A:

ROY COOPER
Governor
ELIZABETH S. BISER
Secretary
BRAXTON DAVIS
Director

NORTH CAROLINA
Environmental Quality

CRC-22-04

January 28, 2022

MEMORANDUM

TO: Coastal Resources Commission
FROM: Curt Weychert
SUBJECT: Amendments to 15A NCAC 7K .0212 – Installation and Maintenance of Sand Fencing

At the last CRAC Meeting, members of the Advisory Council requested Staff to investigate the use of hay bales as an addition to the existing exemption rule language of 15A NCAC 7K .0212 Installation and Maintenance of Sand Fencing. Due to concerns regarding the marine debris associated with structural accessways, gazebos, and particularly sand fencing resulting from storm events, the use of hay bales has been suggested as a natural, biodegradable material to be used for trapping and storing sand.

Sand fencing is a mechanism used within the Ocean and Inlet Hazard AECs to capture and store sand from aeolian transport within the coastal dune system. Over time, naturally and through plantings, vegetation is allowed to naturalize and stabilize the dunes further. Currently, sand fencing can be authorized through a CAMA Minor Development Permit, or if it meets the rule language of 15A NCAC 7K .0212, the activity is considered minor maintenance and improvements under section .0200 and therefore exempt from the permit requirements of the CAMA. However, the use of hay bales is not mentioned in the current exemption rule language as an approved material/method of sand fencing and would require a CAMA Minor Development Permit.

The criteria associated with the use of sand fencing was originally established in 2002, and has been implemented across the state (through CAMA minor permitting and exemptions) to stabilize dunes and dune vegetation. In 2015, a CAMA Minor Permit was issued to two properties in Figure 8 Island to serve as a "pilot study" regarding the efficacy and longevity of the use of hay bales as an alternative material to traditional sand fencing. While the haybales did not last for more than a few months, early site visits and photographs indicated that hay bales did capture and hold sand within the first month of placement on the site. This permit was considered a study and had reporting requirements conditioned on the permit to provide DCM, NC Wildlife Resources Commission (WRC), and US Fish and Wildlife Service with updates regarding displacement, turtle interactions, and storm-related performance. However, the hay bales were not in place long enough for long-term study or analysis.

The following are the existing criteria for sand fencing exempt from CAMA Permit requirements:

- Sand fencing must not impede public access to the beach for recreation, emergency vehicles, or public access.
- Sand fencing must not impede or entrap sea turtle hatchlings.
- Any damaged, or nonfunctional sand fencing is to be removed by the homeowner.
- Sand fencing is identified as evenly spaced, vertical wooden slats less than 5 feet tall connected by wire and supported by no wooden posts or stakes larger than a 2" x 4" or 3" diameter.

- Placement of sand fencing is to be as landward as possible as to not interfere with nesting sea turtles and is not authorized on the wet sand beach area.
- Any sand fencing not placed landward of the crest of primary or frontal dune, must be angled no less than 45° to the shoreline, not exceed 10 feet in length, and placed no less than 7 feet apart.

The experimental Minor Permit issued on Figure 8 Island followed the same criteria listed above, however the permit conditions limited the vertical extent to the height of one bale as per the request of the NC WRC. Recommendations from resource agencies also included removal of all bindings or ties on the bales to prevent entanglement with threatened or endangered species.

In further conversations with WRC, there are continuing concerns regarding the use of hay bales for sand fencing. These concerns include the effects of temperature of the bales in relation to nesting sea turtles, retention of moisture that could cause biological contamination of the area, and the potential introduction of invasive diseases, species, or non-native plants. The WRC also voiced concerns of the scope and scale of these projects moving forward without the proper amount of review and replication of these pilot studies.

The Division has identified several pros and cons in review of this recommendation from the CRAC for the use of hay bales as sand fencing:

+ Hay Bales are a natural, readily available, inexpensive, and bio-degradable material for sand capture
+ Can be installed under the same requirements required by 15NCAC 07K.0212
+ May reduce the amount of marine debris generated after storm-events
- Lack of testing done on various shorelines along the NC coastline
- Potential negative interactions with wildlife:
- Moisture-associated bacteria, mold, introduced pathogens
- Temperature/sediment differences
- Reduced longevity/efficacy
- Potential for increased footprint (bales v. fencing) and interaction with threatened or endangered species (bales may therefore be subject to initial placement during times when interactions would be less likely)

Recommendation:

To date, no CAMA permit applications for the use of hay bales as sand fencing have been denied. At this time, DCM Staff recommend maintaining the current minor permitting process for hay bales until more information can be gathered from multiple sites across the state and further analyzed by resource agencies.

I look forward to discussing this information at your February 2022 meeting.

ATTACHMENT A: 15A NCAC 07H .0212 INSTALLATION AND MAINTENANCE OF SAND FENCING

ATTACHMENT B: IMAGES FROM THE EXPERIMENTAL SITE IN FIGURE 8 ISLAND

ATTACHMENT A:

15A NCAC 07K .0212 INSTALLATION AND MAINTENANCE OF SAND FENCING

Sand fences that are installed and maintained subject to the following criteria are exempt from the permit requirements of the Coastal Area Management Act:

(1) Sand fencing may only be installed for the purpose of: building sand dunes by trapping wind blown sand; the protection of the dune(s) and vegetation (planted or existing).

(2) Sand fencing shall not impede existing public access to the beach, recreational use of the beach or emergency vehicle access. Sand fencing shall not be installed in a manner that impedes or restricts established common law and statutory rights of public access and use of public trust lands and waters.

(3) Sand fencing shall not be installed in a manner that impedes, traps or otherwise endangers sea turtles, sea turtle nests or sea turtle hatchlings.

(4) Non-functioning, damaged, or unsecured, sand fencing shall be immediately removed by the property owner.

(5) Sand fencing shall be constructed from evenly spaced thin wooden vertical slats connected with twisted wire, no more than 5 feet in height. Wooden posts or stakes no larger than 2" X 4" or 3" diameter shall support sand fencing.

(6) Location. Sand fencing shall be placed as far landward as possible to avoid interference with sea turtle nesting, existing public access, recreational use of the beach, and emergency vehicle access.

(a) Sand fencing shall not be placed on the wet sand beach area.

(b) Sand fencing installed parallel to the shoreline shall be located no farther waterward than the crest of the frontal or primary dune; or

(c) Sand fencing installed waterward of the crest of the frontal or primary dune shall be installed at an angle no less than 45 degrees to the shoreline. Individual sections of sand fence shall not exceed more than 10 feet in length (except for public accessways) and shall be spaced no less than seven feet apart, and shall not extend more than 10 feet waterward of the following locations, whichever is most waterward, as defined in 15A NCAC 7H .0305: the first line of stable natural vegetation, the toe of the frontal or primary dune, or erosion escarpment of frontal or primary dune; and

(d) Sand fencing along public accessways may equal the length of the accessway, and may include a 45 degree funnel on the waterward end. The waterward location of the funnel shall not exceed 10 feet waterward of the locations identified in Item (6)(c) of this Rule.

History Note: *Authority G.S. 113A-103(5)c.;*
Eff. August 1, 2002.

ATTACHM ENT B:

5-11-15

ATTACHMENT B:

From: Justin Whiteside
To: Dunn, Maria T.; MacPherson, Tara; Brock, Brendan O; Mairs, Robb L
Cc: Davis, Braxton C; Sales; kathryn_matthews@fws.gov; Ivey, Daisy L
Subject: RE: [External] OIB - November 2023 Straw Bale Photos
Date: Wednesday, November 29, 2023 12:03:07 PM

Maria,

After further investigation the depressed bales near Lumberton Street appear to be because of people sitting on the bales since they have taken longer to cover due to their location landward of the vegetation. Those are ones we would like to relocate to the oceanward side of the vegetation so they can trap the blowing sand. The bales you mentioned at Shallotte Blvd. have not fallen away. We dug down and found the bale compressed. We believe that once the bales became covered that beachgoers would walk over the tops of the bales, compressing them into the sand. You can see all the footprints along and on top of the bales in the photos you submitted.

In addition to the monthly photos, our staff inspects the bales every 1-2 weeks and never saw any blowing straw. There was nothing to indicate that the bales were breaking apart.

We believe if the bales were allowed to be placed 2-high (similar height as sandfence), it would have reduced the chances of beachgoers walking over the bales once they became covered. The bales along E. Third Street are not adjacent to a public beach access and are not experiencing the same compression. This indicates that the bales aren't falling away. The bales along E. Third that aren't as covered are being blocked by a home adjacent to their location.

I will reach out to UNCW to see what information they can provide. I would also like to invite others on this email thread to visit the site and talk with Town staff as well.

Please let me know if anyone has any questions.

Justin W. Whiteside
Assistant Town Administrator
Town of Ocean Isle Beach
910-579-2166 Phone
910-579-2940 Fax

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From: Dunn, Maria T. <maria.dunn@ncwildlife.org>
Sent: Tuesday, November 28, 2023 11:06 AM
To: Justin Whiteside <justin@oibgov.com>; MacPherson, Tara <tara.macpherson@deq.nc.gov>; Brock, Brendan O <brendan.brock@deq.nc.gov>; Mairs, Robb L <robb.mairs@deq.nc.gov>
Cc: Davis, Braxton C <Braxton.Davis@deq.nc.gov>; Sales <sales@coastaltransplants.com>; kathryn_matthews@fws.gov; Daisy Ivey <daisy@oibgov.com>

Subject: RE: [External] OIB - November 2023 Straw Bale Photos

Hi Justin.

Thank you for the photos and report. I was onsite November 7, 2023 and have a slightly different interpretation of the bales. Several of the ones I saw had fallen apart somewhat. They were either depressed on the top or just fallen away with the installed wooden stakes more exposed than the bales. Stakes originally were at or below half bale height. This was especially true at Shallotte Street. A casual look may have them appear to be covered but looking at the height of the bale and surrounding conditions, it seems they deteriorated. The area with the best collection was East Third Street. The bales closest to the access really weren't covered at all, but those closer to the groin were – perhaps the difference was due to the groin influence or beach angle difference due to inlet proximity. However, it is hard to compare as those bales did not seem to appear in the May photos I took. There were also random bales placed landward the frontal dune at Charolotte Street. These were not part of the original proposal. We request their removal.

Attached are some photos referenced above. Do you know if there was any bale temperature work conducted by UNCW? That information during the summer would have been very helpful. I was only able to observe temperatures on one occasion. The temperature collection as well as consistent design and conditions parameters would have made this a better experimental project. There are several aspects that make it difficult to discern if the bales were successful at their intended goal without impacts.

Once again, any additional information along with the reports you have already sent would be appreciated.

Thank you and have a nice holiday.

Maria

Maria T. Dunn
Coastal Coordinator

NC Wildlife Resources Commission
943 Washington Sq. Mall
Washington, NC 27889
252-495-5554

www.ncwildlife.org

From: Justin Whiteside <justin@oibgov.com>
Sent: Tuesday, November 21, 2023 4:25 PM
To: MacPherson, Tara <tara.macpherson@deq.nc.gov>; Brock, Brendan O

<brendan.brock@deq.nc.gov>; Mairs, Robb L <robb.mairs@deq.nc.gov>
Cc: Davis, Braxton C <Braxton.Davis@deq.nc.gov>; Sales <sales@coastaltransplants.com>; kathryn_matthews@fws.gov; Dunn, Maria T. <maria.dunn@ncwildlife.org>; Ivey, Daisy L <daisy@oibgov.com>
Subject: [External] OIB - November 2023 Straw Bale Photos

All:

Attached is the monthly straw bale photos for November 2023. The photos were taken November 20, 2023. The temperature was 64 degrees and partly cloudy. The bales are all fully intact and most are completely covered.

Please let me know if anyone has any questions.

Justin W. Whiteside
Assistant Town Administrator
Town of Ocean Isle Beach
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Charlotte St.

Columbia St.

Durham St.

E. Third St.

Lumberton St.

Shallotte Blvd.

ATTACHMENT C:

From: Justin Whiteside
To: MacPherson, Tara; Mairs, Robb L
Cc: Davis, Braxton C; kathryn_matthews@fws.gov; Dunn, Maria T.; Sales
Subject: [External] OIB - January 2024 Straw Bales
Date: Friday, January 19, 2024 7:40:33 AM
Attachments: E. Third St..jpg

All:

After back to back storm events in December we only have 1 remaining area of straw bales. The attached photo is from the E. Third St. location. The photo was taken January 16, 2024. The weather was clear and approximately 51 degrees.

We would like to have some discussion on replacing the bales. They were working and getting covered with sand prior to the storm events. Even though they washed away, they left no remains or debris on the beach strand.

Justin W. Whiteside
Town Administrator
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ATTACHMENT D:

15A NCAC 07H .03XX INSTALLATION AND MAINTENANCE OF WHEAT STRAW BALES FOR SAND FENCING

(a) Wheat straw bales shall only be installed by local or state government or a local homeowners association as defined in G.S. 47F-1-103(3) that has the authority to approve the locations of structures on lots within the territorial jurisdiction of the association and has jurisdiction over at least one mile of ocean shoreline, for the purpose of building and protecting dunes by trapping windblown sand.
(b) Wheat straw bales shall not impede existing public access to the beach, recreational use of the beach, or emergency vehicle access. Wheat straw bales shall not be installed in a manner that impedes or restricts established common law and statutory rights of public access and use of public trust lands and waters.
(c) Wheat straw bales shall not be installed in a manner that impedes, traps or otherwise endangers sea turtles, sea turtle nests or sea turtle hatchlings. CAMA permit applications for wheat straw bales shall be subject to review by the Wildlife Resources Commission and the U.S. Fish and Wildlife Service in order to determine whether the proposed design or installation will have an adverse impact on sea turtles or other threatened or endangered species.
(d) The permittee shall remove any ties or binding from wheat straw bales during installation;
(e) Wheat straw bales shall not be staked down or otherwise secured to the public trust beach or dunes, or to each other.
(f) Wheat straw bales shall be placed as far landward as possible to avoid interference with sea turtle nesting, public access, recreational use of the beach, and emergency vehicle access. Additionally:

i. Wheat straw bales shall not be placed on the wet sand beach;
ii. Wheat straw bale sections shall not exceed 2 feet in width, 3 feet in height as measured from the bottom bale, and 10 feet in length;
iii. Wheat straw bales installed on or waterward of the crest of the frontal or primary dune shall be installed at an angle no less than 45 degrees to the shoreline. No portion of a wheat straw bale section shall extend more than 10 feet waterward of the following locations as defined in 15A NCAC 07H .0305: the first line of stable and natural vegetation, the toe of the frontal or primary dune, or the erosion escarpment of the frontal or primary dune;
iv. Wheat straw bales along public accessways may span the length of the structural accessway and may be aligned no less than 45 degrees to the shoreline on the waterward end. The waterward location of the sections shall not exceed 10 feet waterward of the locations identified in Sub-Item (f)(iii) above; and
v. A minimum of seven feet of spacing shall be maintained between any sections of dune building materials.

(g) Non-functioning, damaged, or wheat straw bale sections that have moved from their authorized alignment shall be repaired or removed by the permittee.

History Note: *Authority G.S. 113A-107; 113A-113(b)(6);*
Eff. Month XX, 2024;