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*Figure 1 - Swamp Oak community Broken Head.*

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**Note:** The information in this plan is subject to clarification or amendment due to changes in legislation, agencies and organisations over time. It is the responsibility of the user to ensure compliance with relevant legislation.

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## Acknowledgement

The People of the Bundjalung nation developed and maintained a deep and rich connection with the land of the Byron area. The land nourished all of the person, supplying physical, spiritual, cultural and identity necessities. We wish to acknowledge these First Peoples, and pay our respects to Elders - past, present and future.



## Contents

Acknowledgement .....	3
1. Objective .....	5
2. Background and Legislation .....	5
3. Current Mapping .....	6
PCT Mapping .....	6
Byron Shire 2021 Vegetation Mapping .....	8
4. Mapping Update Methodology .....	10
Site Assessments .....	11
5. Results .....	12
Categorisation .....	12
6. Conclusions .....	16
7. Recommendations .....	16
8. Data .....	16
Appendix A - Site Assessment Data Collected .....	17

## List of Figures

<i>Figure 1 - Swamp Oak community Broken Head. ....</i>	<i>1</i>
<i>Figure 2 - Distribution of Swamp Oak in Byron Shire based on NSW PCT mapping. ..</i>	<i>8</i>
<i>Figure 3 - Distribution of Swamp Oak based on Byron Shire Council Vegetation Mapping. ....</i>	<i>10</i>
<i>Figure 4 - Swamp Oak appearance in aerial photography. ....</i>	<i>11</i>
<i>Figure 5 - Swamp Oak site assessment locations map. ....</i>	<i>13</i>
<i>Figure 6 - Categorisation of Swamp Oak in the north of Byron Shire. ....</i>	<i>14</i>
<i>Figure 7 - Categorisation of Swamp Oak in the south of Byron Shire. ....</i>	<i>15</i>

## List of Tables

<i>Table 1 - Condition thresholds, classes and categories for patches of Coastal Swamp Oak Forest of NSW and SE Queensland. ....</i>	<i>5</i>
<i>Table 2 - Swamp Oak Communities PCT mapping in Byron Shire .....</i>	<i>7</i>
<i>Table 3 - Byron Shire Council LM vegetation types dominated by Swamp Oak. ....</i>	<i>8</i>
<i>Table 4 - Total area of Swamp Oak in Byron Shire 2021 and 2023 mapping .....</i>	<i>12</i>



## 1. Objective

Update Byron Shire 2021 Vegetation mapping to clearly identify recently listed threatened ecological community - Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland

Assessment to include desk top analysis and targeted ground truthing to validate boundaries where required.

- Area of land mapped as Coastal Swamp Oak woodland.
- Ground truthing methodology used

## 2. Background and Legislation

Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community was listed as Endangered 20 March-2018 under the Federal EPBC Act 1999.

(<https://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=142>).

The condition thresholds, classes and categories are the key diagnostic criteria to define Coastal Swamp Oak Forest and were used in the groundtruthing and mapping to determine the categorisation of Swamp Oak in Byron Shire in 2023 (See Table 1 below).

Although the EPBC-listed Coastal Swamp Oak Forest as described above is not directly listed under NSW legislation, the threatened community *Swamp Oak Floodplain Forest of North Coast, Sydney Basin and South East Corner Bioregion* is of similar composition. This Swamp Oak Community can have a higher percentage or be dominated by *Melaleuca quinquenervia* Broad-leaved Paperbark with a more diverse midstorey and understorey. The structure of the community may vary from open forests to low woodlands, scrubs or reedlands with scattered trees and is usually below 20 m elevation on land subject to inundation. *Swamp Oak Floodplain Forest of North Coast, Sydney Basin and South East Corner Bioregion* is listed in NSW as a threatened community under NSW Biodiversity Conservation Act 2016 previously the Threatened Species Act 1995.

*Table 1 - Condition thresholds, classes and categories for patches of Coastal Swamp Oak Forest of NSW and SE Queensland.*

Condition thresholds  Patch size classes →  ↓ Vegetation quality classes	Large patch The patch is at least 5 ha	Medium patch The patch is at least 2 ha and less than 5 ha	Small contiguous** The patch is at least 0.5 ha and less than 2 ha, and is connected to a larger area of native vegetation of at least 5 ha	Small patch The patch is at least 0.5 ha and less than 2 ha
<b>HIGH QUALITY</b> <b>Predominantly native understorey</b> Non-native species comprise <b>less than 20%</b> of total understorey vegetation cover*	<b>CATEGORY A</b> A <u>large patch</u> that meets <b>key diagnostics</b> and has a <u>predominantly</u> native understorey	<b>CATEGORY B</b> A <u>medium patch</u> that meets <b>key diagnostics</b> and has a <u>predominantly</u> native understorey OR A <u>small patch</u> that meets <b>key diagnostics</b> and has a <u>predominantly</u> native understorey and is <u>contiguous**</u> with another <u>large</u> area of native vegetation	<b>CATEGORY C</b> A <u>small patch</u> that meets <b>key diagnostics</b> and has a <u>predominantly</u> native understorey	
<b>GOOD QUALITY</b> <b>Mostly native understorey</b> Non-native species comprise <b>less than 50%</b> of total understorey vegetation cover* AND transformer species*** comprise <b>less than 30%</b> of total understorey vegetation cover*	<b>CATEGORY B</b> A <u>large patch</u> that meets <b>key diagnostics</b> and has a <u>mostly</u> native understorey	<b>CATEGORY C</b> A <u>medium patch</u> that meets <b>key diagnostics</b> and has a <u>mostly</u> native understorey OR A <u>small patch</u> that meets <b>key diagnostics</b> and has a <u>mostly</u> native understorey and is <u>contiguous**</u> with another <u>large</u> area of native vegetation		
<b>MODERATE QUALITY</b> <b>Some native understorey</b> Non-native species comprise <b>less than 80%</b> of total understorey vegetation cover* AND transformer species*** comprise <b>less than 50%</b> of total understorey vegetation cover*	<b>CATEGORY C</b> A <u>large or medium patch</u> that meets <b>key diagnostics</b> and has <u>some</u> native understorey			
<p>*Refers to total perennial understorey vegetation cover for the patch of the ecological community. Includes vascular plant species of all layers below the canopy with a life-cycle of more than two growing seasons. It includes herbs (graminoids and forbs), grasses, shrubs and juvenile plants of canopy species, but does not include annual plants, cryptogams, plant litter or exposed soil. Areas of little to no understorey vegetation cover (e.g. plant litter) are included if key diagnostics are met and non-native species are below thresholds.</p> <p>**Contiguous means the patch is connected or in close proximity (within 30 m) to another area of native vegetation.</p> <p>***Transformer species (e.g. <i>Chrysanthemoides monilifera</i>, <i>Asparagus</i> spp, <i>Pennisetum</i> spp, <i>Ipomoea</i> spp. etc.) are non-native plant species with the potential to permanently change the character, condition, form or nature of patches of the ecological community. See p. 43 for further information on weeds, including transformer species. Annual weeds, such as <i>Symphyotrichum subulatum</i> (saltmarsh aster), may be seasonally very abundant and temporarily restrict the development of native species, but would not be counted as transformer weeds in determining condition.</p>				

### 3. Current Mapping

#### PCT Mapping

Eastern NSW State Vegetation Type Map (SVTM) v1.1 (sourced from DPIE) includes the following communities (Table 2) that contain Swamp Oak.

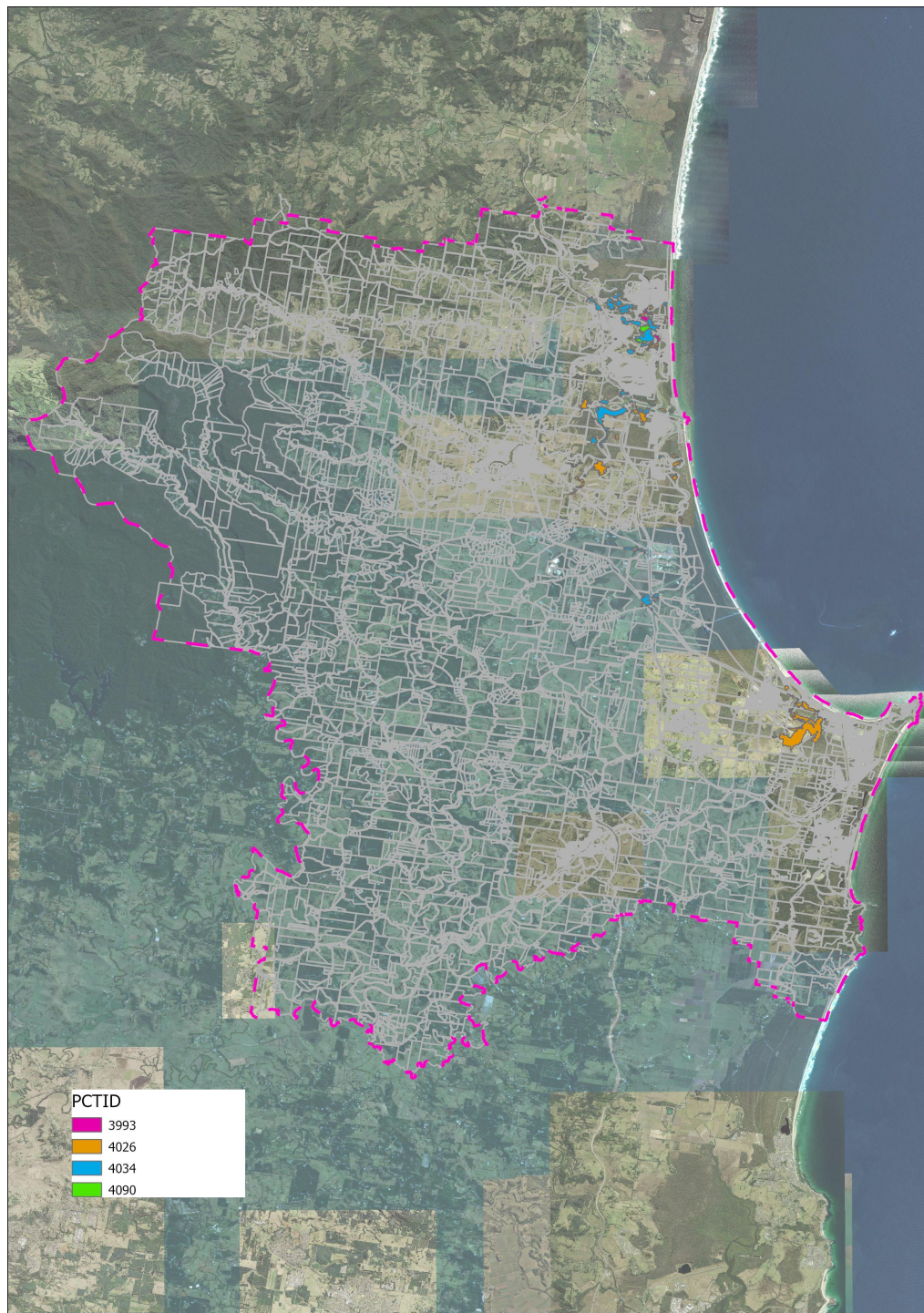
Table 2 contains all PCTs in Byron LGA that have “Swamp Oak” in the PCT Name (sourced from SVTM).

Figure 2 displays Swamp Oak PCTs based on the SVTM mapping.

*Table 2 - Swamp Oak Communities PCT mapping in Byron Shire*

<b>PCTID</b>	<b>PCT Name</b>	<b>Area (Ha)</b>
3993	Far North Swamp Oak-Paperbark Tidal Forest	10.5
4026	Estuarine Sea Rush Swamp Oak Forest	151.1
4034	Far North Swamp Oak-Tuckeroo Swamp Fringe Forest	146.6
4090	Far North Estuarine Mangrove-Swamp Oak Forest	10.6
		<b>318.8</b>





*Figure 2 - Distribution of Swamp Oak in Byron Shire based on NSW PCT mapping.*

### **Byron Shire 2021 Vegetation Mapping**

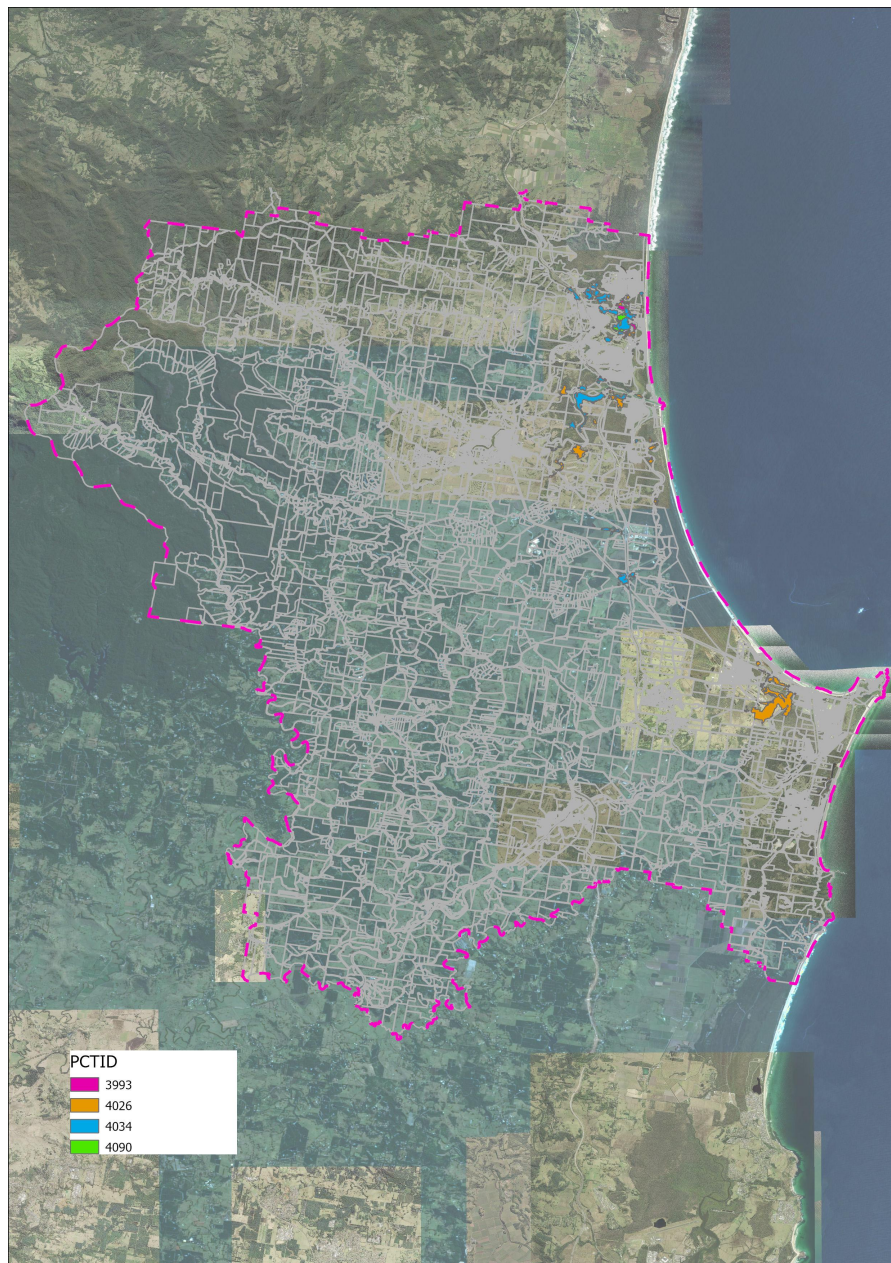
Byron Shire Vegetation mapping includes the following vegetation communities (LM veg type Table 3) where Swamp Oak is dominant. This mapping was originally mapped by Landmark Ecological Services in 2015 and updated in 2021.

Figure 3 shows the distribution of Swamp Oak communities in Byron Shire based on Byron Shire Council vegetation mapping.

*Table 3 - Byron Shire Council LM vegetation types dominated by Swamp Oak.*



<b>Veg Type</b>	<b>PCT ID</b>	<b>Area (Ha)</b>
Swamp Oak	4034/4026	42.6
Swamp Oak-Cabbage Palm	4034	4.1
Swamp Oak-Callicoma-Paperbark	4026	0.7
Swamp Oak-Camphor Laurel	4034	0.4
Swamp Oak-Eucalypt	4026	0.8
Swamp Oak-Mangrove	4026	8.3
Swamp Oak-Paperbark	4026	13.8
Swamp Oak-Paperbark-Wattle	4034	1.1
Swamp Oak-Paperbark-Willow Bottlebrush	4026	1.6
Swamp Oak-Rainforest	4034	6.0
Swamp Oak-Sedgeland	4026	0.2
Swamp Oak-Swamp Box-Rainforest	4034	0.7
Swamp Oak-Wattle	4034	0.4
Swamp Oak-Wattle-Paperbark	4034	1.0
Swamp Oak-Wattle-Swamp Mahogany, Forest Red Gum	4034	0.8
Swamp Oak on metasediments	4034	0.1
Swamp Oak+Forest Red Gum	4034	0.3
Swamp Oak+Littoral Rainforest	4034	0.3
Swamp Oak+Mangrove	4026	2.2
Swamp Oak+Paperbark	4026	79.6
Swamp Oak+Paperbark, Eucalypt	4034	3.5
Swamp Oak+Paperbark, Rainforest	4034	0.8
Swamp Oak+Paperbark, Swamp Box	4026	1.5
Swamp Oak+Pink Bloodwood, Swamp Box	4034	20.6
Swamp Oak+Rainforest	4034	1.6
Swamp Oak+Saltmarsh, Mangrove	4026	0.2
Swamp Oak+Swamp Box	4026	1.0
Swamp Oak+Swamp Box, Forest Red Gum, Paperbark	4026	1.4
Swamp Oak+Swamp Mahogany	4026	12.7
Swamp Oak+Tuckeroo, Mangrove	4034	0.2
		208.5



*Figure 3 - Distribution of Swamp Oak based on Byron Shire Council Vegetation Mapping.*

Note, the PCT mapping includes National Park Estate whereas the Byron Shire Council vegetation mapping does not. This and the scale of the mapping would account for the difference in total area of the Swamp Oak total area.

## 4. Mapping Update Methodology

There is an overlap between the NSW PCT mapping and Byron Shire vegetation mapping of Swamp Oak vegetation in Byron LGA. It was determined that the Byron Shire vegetation mapping was more accurate and mapped at a finer scale than the NSW PCT mapping and would be used as the primary spatial layer for updating Swamp Oak distribution in Byron Shire. This was based on local expert knowledge of the location of Swamp Oak by Botanist, Dr

Joanner Green as well as the draft report by EarthScapes Consulting, Assessment of Plant Community Type (PCT) Mapping in Byron Shire (2022).

In addition to onground survey (ground truthing) Nearmaps aerial photography was used to provide additional clarity to update the boundaries of the Swamp Oak communities in the 2021 Byron Shire vegetation mapping. Swamp Oak canopy is easily distinguished with current aerial photography as shown in Figure 4.



Figure 4 - Swamp Oak appearance in aerial photography.

Swamp Oak polygons from BSC vegetation mapping were assigned a category based on the key diagnostic criteria described in Table 1 Conservation advice (incorporating listing advice) for the Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community (Coastal Swamp Oak Forest NSW and SEQ\_ Approved Conservation Advice (environment.gov.au).

Note, the *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (s266B) Approved Conservation Advice (including listing advice) for the Natural Temperate Grassland of the South Eastern Highlands (EC 152)* advises that very small or degraded patches may not meet the minimum condition thresholds and will be excluded from national protection (Forest NSW and SEQ\_ Approved Conservation Advice 2018). Over time these patches may increase in area and condition to a point where they may meet thresholds. It is recommended that mapping be updated every ten years.

## Site Assessments

Ground-truthing of sites with known Swamp Oak was conducted between November 2022 and January 2023. Ground truthing included walking through and around the boundaries of the vegetation community mapping the area on a tablet using Avenza.

Site selection was based on:

- Tenure - National Park Estate was a lower priority.
- Accessibility - Where permission from landowner was granted or assessment could be completed from the edge of the property.
- Previous observations - Sites not previously ground-truthed were prioritised.
- Areas that do not include a flora plot under PCT mapping.

A large number of sites were adjacent to the Brunswick River. A boat was used to access these locations.

Appendix A describes the data collection fields.



## 5. Results

All of the sites mapped as Swamp Oak met the following key criteria:

- Occurs from south-east Queensland to southern NSW within the South Eastern Queensland, NSW North Coast, Sydney Basin, or South East Corner bioregions.
- Occurs in coastal catchments at elevations up to 50 m ASL, typically less than 20 m ASL.
- Occurs on soils derived from unconsolidated sediments (including alluvium)
- Has an open woodland, woodland, forest, or closed forest structure, with a tree canopy that has a total crown cover of at least 10 per cent.
- Does not occur on rocky headlands, sea cliffs or other consolidated sediments.
- Occurs within 30km of the coast.
- Has a canopy of trees dominated by *Casuarina glauca*.

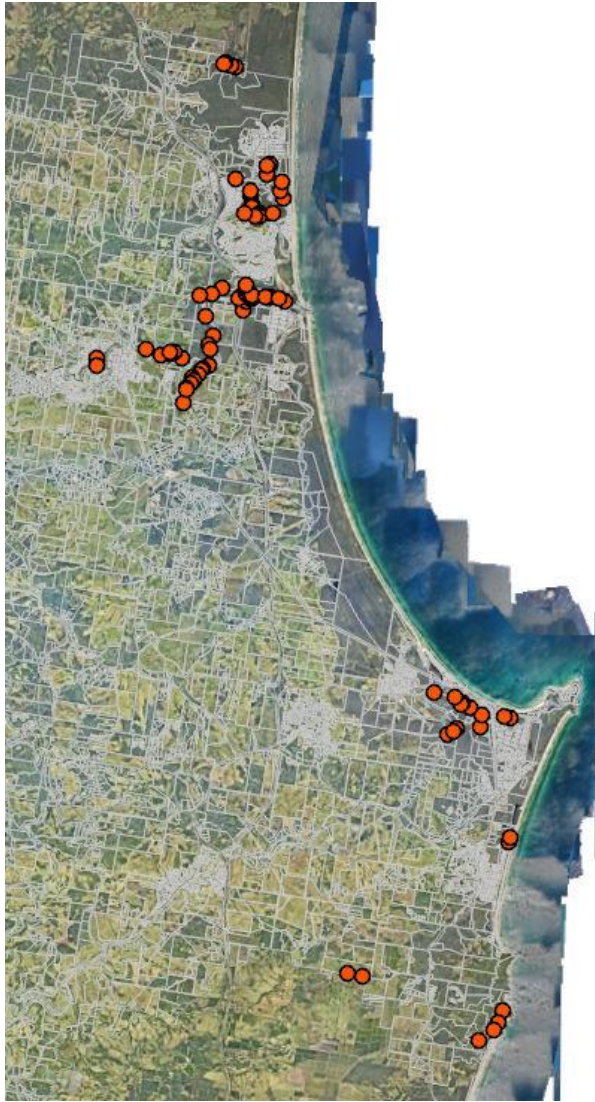
### Categorisation

85 site assessments were conducted (see Figure 5) and used to inform the categorisation of the Swamp Oak communities. The Swamp oak vegetation community in Byron shire has been regenerating in many areas and these patches are meeting key diagnostic criteria as they increase in area.

Table 4 shows the change in Swamp Oak area after the mapping updates.

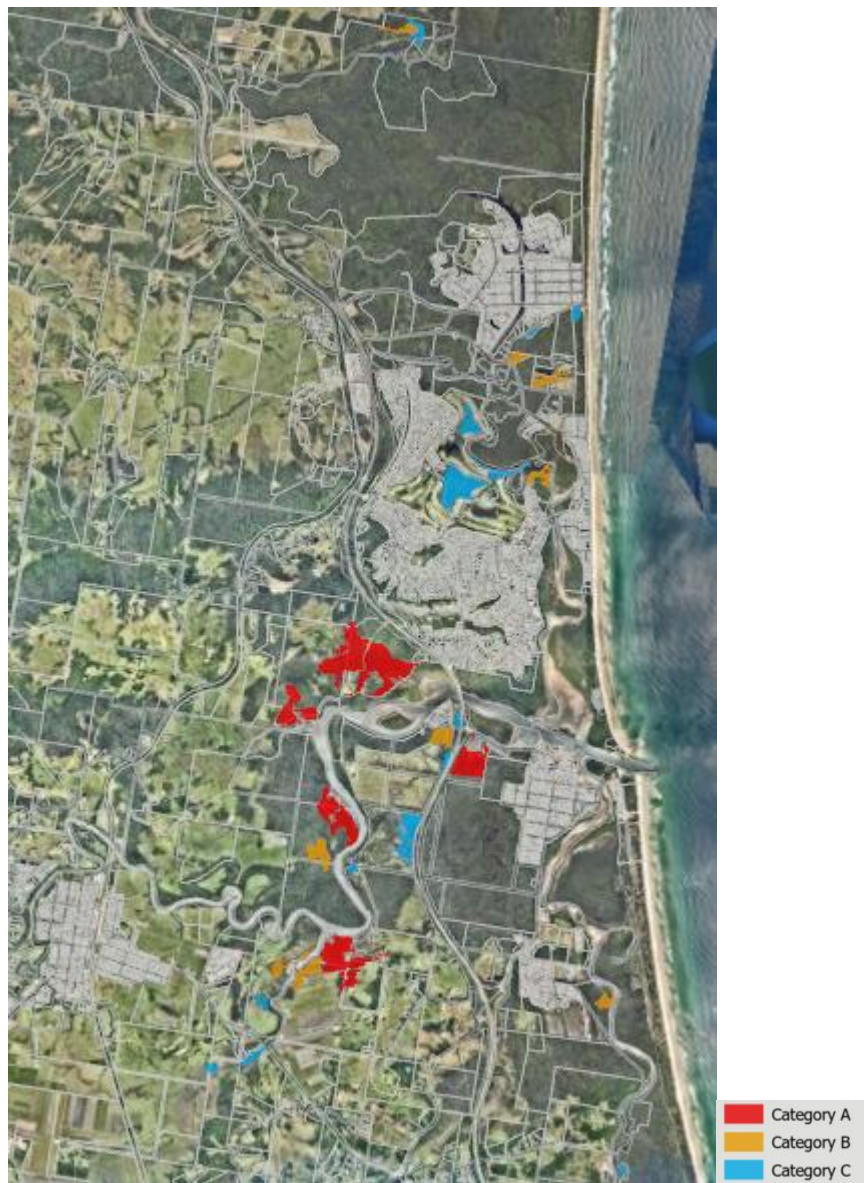
*Table 4 - Total area of Swamp Oak in Byron Shire 2021 and 2023 mapping*

Area of Swamp Oak dominated communities 2021 mapping	208 Ha
Area of Swamp Oak dominated communities 2023 mapping	215 Ha



*Figure 5 - Swamp Oak site assessment locations map.*

Polygons were assigned a Category of A,B, C or Nil based on the criteria in Table 1. Figures 6 and 7 show examples of the results of the categorisation.



*Figure 6 - Categorisation of Swamp Oak in the north of Byron Shire.*



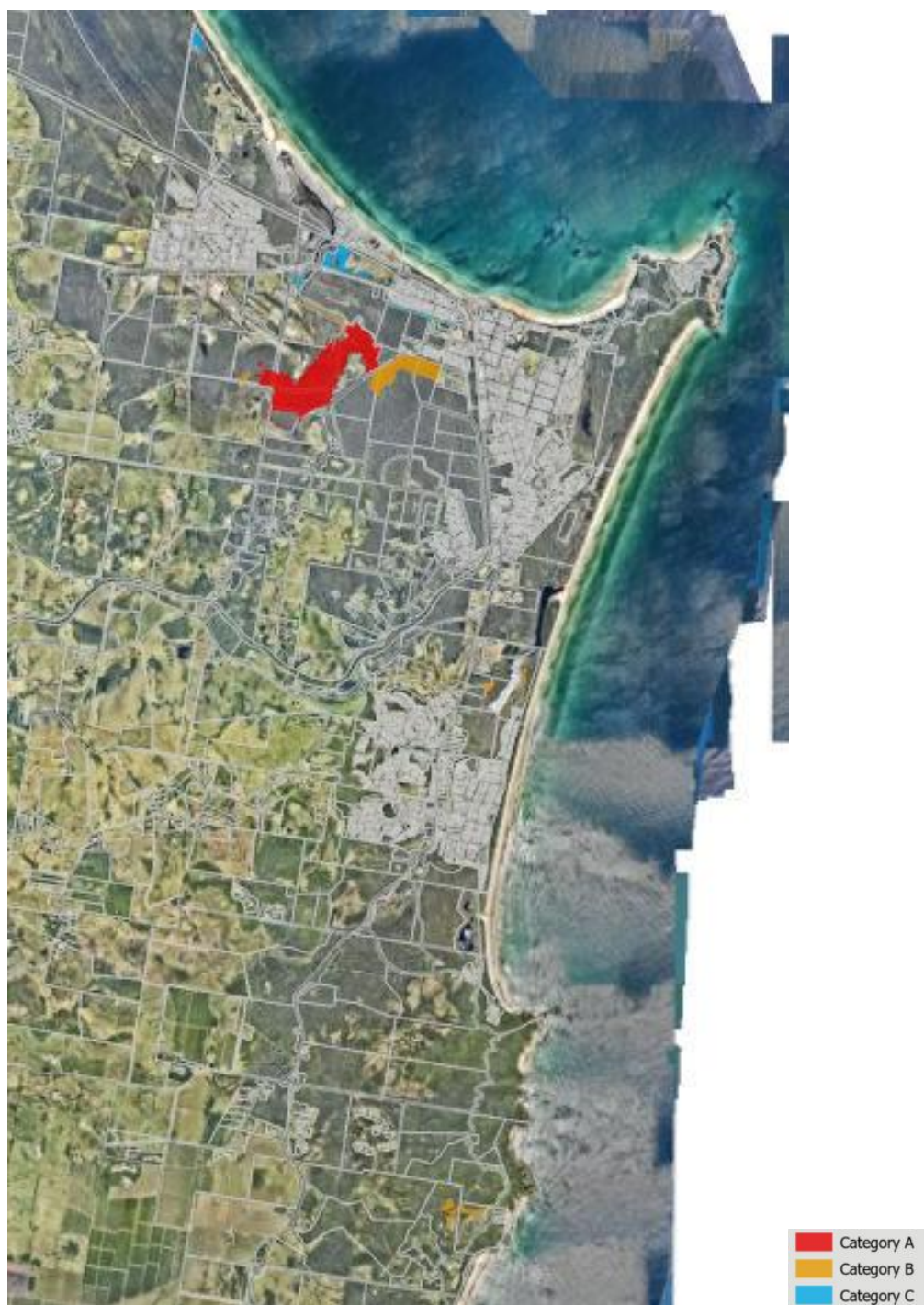


Figure 7 - Categorisation of Swamp Oak in the south of Byron Shire.

Table 5 shows the results of the categorisation of Swamp Oak vegetation (refer to Table 2 for criteria). Categories A, B & C meet the criteria for EEC.

Table 5 - Swamp Oak Categories

Category	Total Ha
A	108.4
B	42.2
C	39.1
Other	25.7
	<b>215.4</b>

The areas in the “Other” category are where Swamp Oak occurs but does not meet the diagnostic criteria outlined in Table X. It should be noted that these areas are likely to still be listed under the Biodiversity Conservation Act, 2016.

## 6. Conclusions

A total of 215 hectares of Swamp Oak community was mapped across Byron LGA. This is an additional 7 hectares from the 2021 mapping of this community.

The most likely reason for this is more accurate mapping of boundaries with ground-truthing and NearMaps aerial photography.

Of the 215 hectares, 189.7 hectares meet the diagnostic criteria for the EPBC Act 1999. 25.7 hectares of Swamp Oak do not meet the diagnostic criteria for the EPBC Act but are threatened ecological community under the Biodiversity Act 2016.

It should be noted that whilst the area remains stable since previous mapping in 2017 and 2021, it is still a small total area.

It is important that the Endangered Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community continues to be protected.

## 7. Recommendations

Recommendations from this project include:

- Incorporating this updated mapping into Byron Shire High Environmental Value (HEV) mapping.
- Updating all EEC vegetation mapping every 10 years.
- Directing resources into targeted restoration works.

## 8. Data

The data associated with this project is located at:

Photos: G:\EPS\NATURAL ENVIRONMENT\\_Biodiversity\GIS\Veg2022\Swamp Oak Data Collection\Photos

GIS Project: G:\EPS\NATURAL ENVIRONMENT\\_Biodiversity\GIS\Veg2022\Veg2022.aprx

Site Assessment Points:

G:\EPS\NATURAL ENVIRONMENT\\_Biodiversity\GIS\Veg2022\Swamp Oak Data Collection\Data\SwampOak.gdb\SwampOakAssessmentSites

Swamp Oak spatial layer:

G:\EPS\NATURAL ENVIRONMENT\\_Biodiversity\GIS\Veg2022\Swamp Oak Data Collection\Data\SwampOak.gdb\SwampOakMapping20230203

## Appendix A - Site Assessment Data Collected

Field	Field Description
ID	Unique ID
Field Assessor	Name of Assessor
Assessment Date	Assessment Date
Latitude	GCS_WGS_1984
Longitude	GCS_WGS_1984
Swamp Oak Canopy	<10% 10 - 30% 30 - 50% 50 - 70% 70 - 90% >90%
Non-Native Understorey	<20% 20 - 50% 50 - 80%
Transformer Species Understorey	<30% 30 - 50%
Connected to a larger area	Yes No Partial (connected but small/narrow remnant)
Photos	
Other Observations	
Observation Type	<ul style="list-style-type: none"> <li>● Seen from edge of polygon</li> <li>● Walk through</li> <li>● Distance assessment</li> <li>● No ground truthing</li> </ul>