Bees on AONB mine sites

A project scoping

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Photo. Long-horned Bee

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Summary

- The Cornish AONB is of national significance for its bee fauna. Three endangered bees have probably larger populations in the Cornish AONB than anywhere else in the UK.
- 4 Priority S.41, 7 Red Data Book and 10 Nationally Scarce bees have been identified by this study to be found within the project area (Fig 3.).
- There is strong linkage between bee rich landscapes and Cornish mining heritage.
- Over 1820 mine sites are present in the AONB. About 400 sites have been identified as key sites to link to an AONB bees and mines project.
- The best sites occur on the Lizard, West Penwith and the North Coast of Cornwall AONB.
- The recommended way to target conservation measures is to focus on key site clusters or bee mine hot-spots.
- The recommended project should have two main themes. Advise land managers on high value sites and create "bee meadows" near focus areas.

key mining bee site south facing bare ground and flower-rich habitats

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1.1. Introduction

Pollinators are extremely important key-stone species. They underpin biodiversity and are vitally important for both food production and a sustainable landscape. Bees declines have caught the public imagination.

"British people consider the decline in bee numbers to be the most serious environmental issue – more than climate change - and bees are the one endangered species most people would save" (You gov 2014)"

There is very limited public understanding of the Cornish wild bee species.

The cultural heritage and recreational value of the mine sites is very high. The mining history is a large and important legacy on the Cornish landscape. Whilst our miners have long packed up their shovels and left, our bees are still tunnelling on these abandoned sites!

1.2. What is the Scoping survey ?

The Scoping survey has been conducted to help provide the Cornwall AONB Unit with an evidence base that can be used in supporting a bid for a fully funded project that could benefit bees across important mining sites within the AONB.

It includes survey and desk-top assessment to scope what are the practical opportunities for a project focused on bees and mines. This survey provides a pragmatic overview for the opportunities for more detailed project work by the AONB Unit on pollinators.

1.3. Methodology

The survey consisted of a GIS study of mine sites based on extensive "ground truthing" by the author throughout Cornwall over at least 15 years. The survey compared visual and data-base features from a range of sources. ERICA biological records were compared with CC mine mapping GIS to establish where the priority bees are in relation to mine sites. Cornwall mine site GIS (Environment Agency 2016) and (Cornwall Council 2016) datasets were also utilised alongside satellite imagery and on-line OS Six Inch, 1888-1913 (National Library of Scotland 2016). This was then combined with both previous field work and local knowledge to get a pragmatic overview of key sites within the AONB which warrant targeting a bee and mine project.

A review of the scarcity of the Cornish bees was conducted using (Falk 1991), (Archer 2015) and (Archer 2014). This is much less straightforward than might be expected as a comprehensive Red Data Book reflecting the modern distribution of bees is not available.

2.1. Bee fauna of the AONB

The Cornish AONB is of national significance for its bee fauna. The AONB area has probably larger populations of 3 endangered bees species than anywhere else in the UK. The AONB includes most of the best bee sites in Cornwall (notable exceptions include the major dune sites of Penhale and Gwithian). The North Cornish Coast is important as it has high quality flower-rich coastal habitats as a linear strip.

4 Priority S.41, 7 Red Data Book and 10 Nationally Scarce bees have been identified by this study to be found within the project area (Fig 3.).

Fig 1. Hot spot map

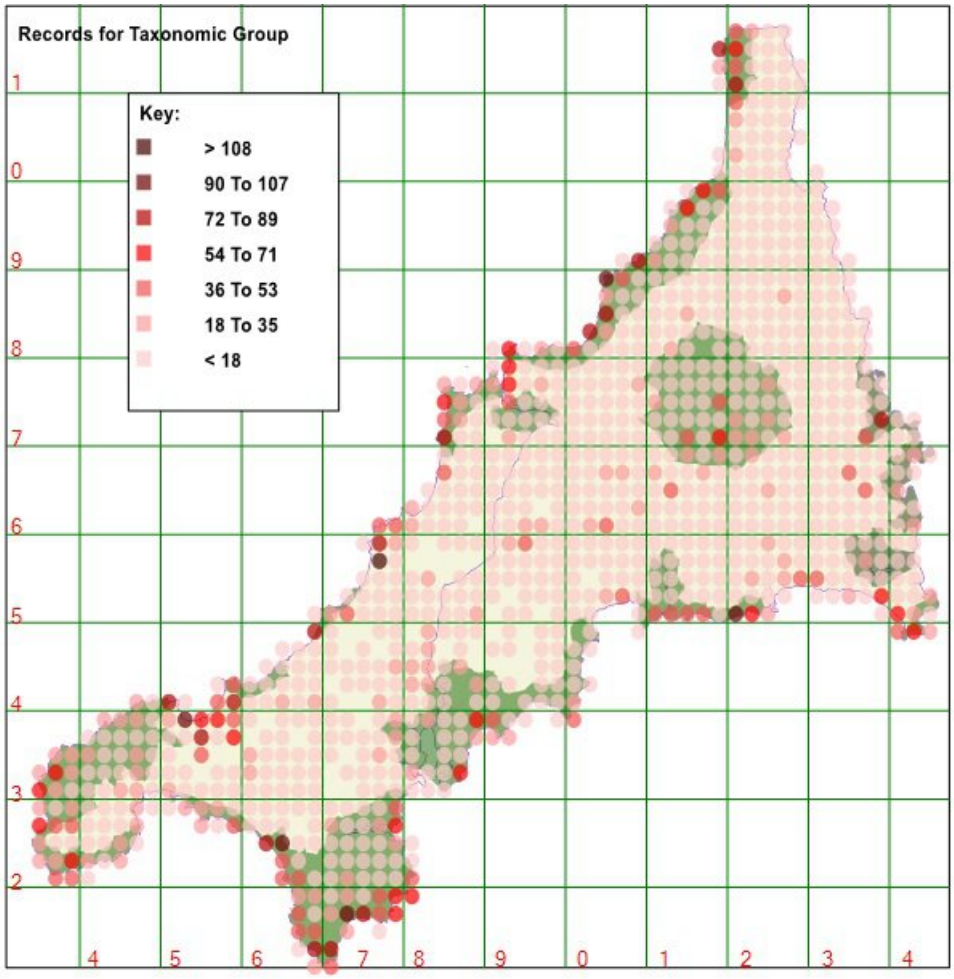


Fig 1. shows the number of Aculeate (Bee, Ant and Wasp) species recorded within Cornwall and Cornwall AONB. Most of the best sites are coastal, with sites within the AONB supporting more than 90 species of bee and wasp. Kennack area within 8. South coast western (Lizard) supports 106 species and Tintagel area within 2. Pentire to Widemouth has 99 species.

2.2. Why are mines within the AONB sites important ?

The Cornish mine sites are specifically important for a number of reasons. They have post-industrial habitats of great importance to bees and other insects, in particular bare ground and early successional grassland or heathland on the disturbed spoil of the workings. Other features include south-facing structures such as banks and walls for nest sites. Many mine sites have also been excluded from intensive agricultural practices and have retained semi-natural flower rich habitats now rare in intensive farmland.

The other highly important feature of the Cornish mine sites within the AONB is their habitat connectivity i.e. the coastal mine sites are likely to be close to a long strip of connected coastal flower-rich habitats of high significance for their pollinator fauna. Alternatively, mines on Penwith, Lizard and Bodmin may be connected to important moorland habitats.

2.3. What are the threats to bees and mine sites ?

The Cornish Bumblebee Atlas (Saunders 2016) indicates a startling decline in bumblebee species in Cornwall since the middle of the 20th century. This equates to a quarter of the Cornish bumblebee fauna lost in one person's lifetime. The other mining bees have almost certainly declined at a similar rate. Bees such as The Long-horned Bee although only considered scarce in (Archer 2015) has roughly halved the number of sites in Cornwall in the last 20 yrs and is very vulnerable to extinction on some of the sites that remain.

The biggest impact has been loss of flowers caused by intensive agriculture in the post war period. Areas of flower-rich grassland in England and Wales have declined by over 90% between 1934 and 1984 (Fuller 1987).

Mine sites are still threatened and vulnerable to reduction in habitat quality or area.

The main threats include:

- Scrub succession, through lack of management.
- Over grazing or summer grazing on or near sites.
- Invasive non-native plants.
- Site isolation.
- Loss of specialised micro-niches.
- Climate change.
- Intensive agriculture on or near sites (particularly by increased fertiliser use).
- Lack of awareness leading to management regimes of negative impact on pollinators.

3.1. Key mine sites for bee pollinators within the AONB

Key sites were selected using data from a range of sources (see methodology). All recorded mine sites on the EA register and CC mine site data were classed by quality from A to F (A with the highest score). The sites were classed using a pragmatic approach which tried to draw together both historical, ecological and cultural factors.

Some of the sites in the C-D range were more difficult. Difficult sites to classify may have only an adit marked on the map or GIS, and no other mining structures, but maybe have some quarries or other historical features and/or have some good bee habitats.

Site were scored highly (A-C) with the following features

- Key bee (Category A and B) species recorded nearby.
- Key pollinator landscape (Landscape area known to be of high value for rare bees).
- Bare-ground features.
- High quality above ground mine features (e.g. spoil heaps or engine houses).
- Other historical features likely to pertain to mine history (sometimes guestimate on available mapping).
- Heathland and flower-rich grassland present.
- Other "Brownfield" features.
- Within a iconic landscape with a strong link with mining heritage (North and South coast).

Site were scored (D-F) with the following features

- Isolated from high quality habitats.
- Non or few of the above features.
- Likely to be private farmland.
- Access difficult or public engagement may be difficult.

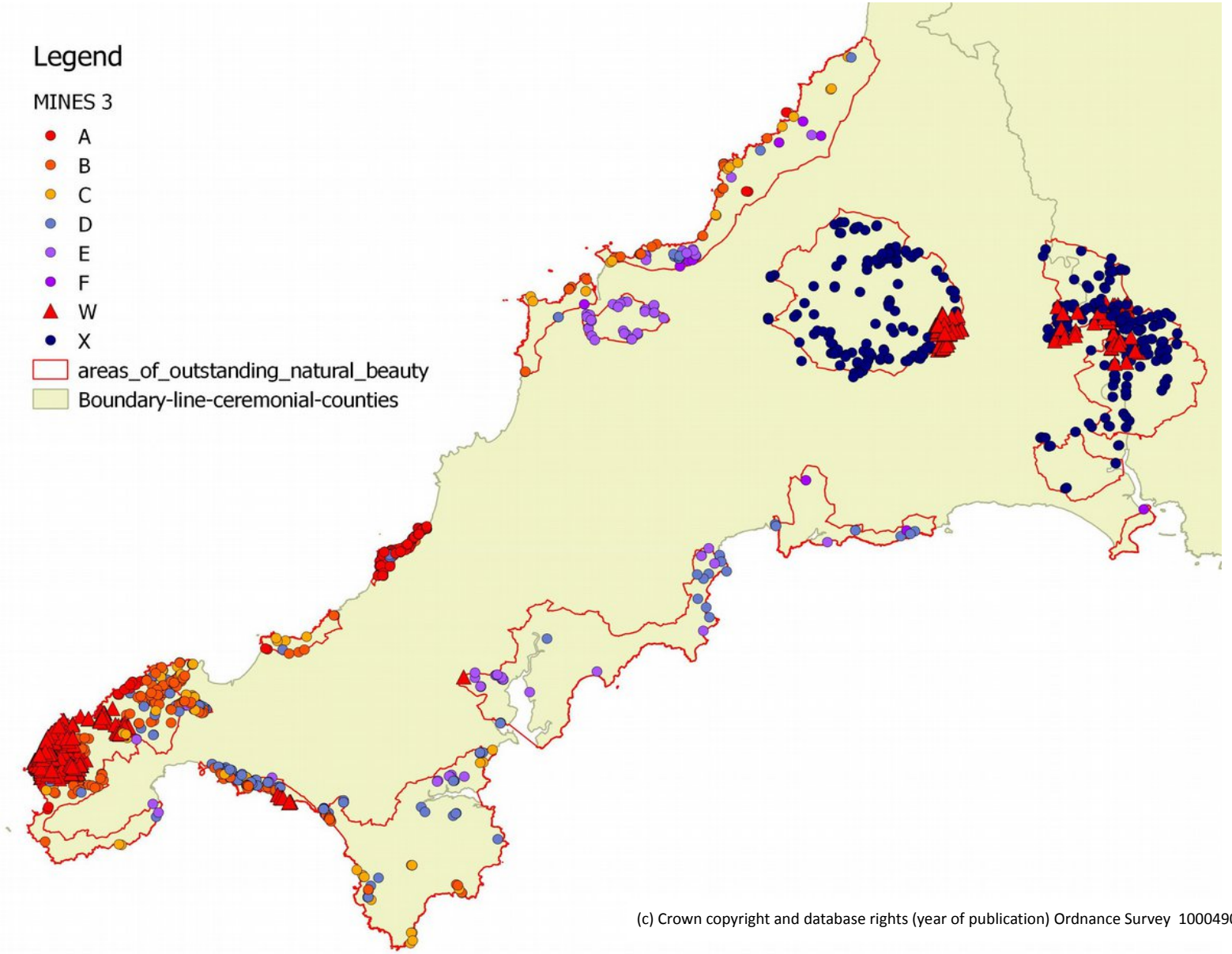
Site were scored (X) with the following features

- Likely to be difficult to fit into the project or excluded as within Devon AONB

Site were scored (W) with the following features

- World Heritage Sites

Fig 2. Key mine sites for bee pollinators within the AONB



3.2. List of key sites within AONB compartments

See map fig 2.

1. Hartland

Key bee species (Category A and B) present. Poor mining historical features and related infrastructure. Morwenstow possible inclusion.

2. Pentire to Widemouth

Key bee species (Category A and B) present. Few historical mine structures and related infrastructure, but very good habitats. Prince of Wales quarry Delabole, Tintagel, Treknow and Boscastle. Although poor link to mining heritage unless quarry features included as related Cornish industry creating good mining bee features.

3. Camel estuary

Poor area for key bee species. Quite a few mine sites but moderate to poor quality historical mine structures and related infrastructure. Exclude most or all sites

4. Trevose to Stepper point

Key bee (Category A and B) species present. Few historical mine structures and related infrastructure. Some key areas of maritime coastal grassland. Key sites Steeper Point/Gunver Head and Bethruthan Steps.

5. St Agnes

St Agnes Mining District (WHS) sites not assessed but best area for both historical mine structures and related infrastructure. Key bees (Category A and B) present. Very large areas of bare ground unlike any of the other units. Large number of potential mines but clustered in a few large sites.

6. Godrevy to Portreath

Key bee (Category A and B) species. Good historical mine structures and related infrastructure only on key sites. Godrevy dunes, Portreath and Red River. Red River area not on EA or CC mapping. But has mines marked on the historical maps. This area has some typical brownfield /bare ground habitats.

7. West Penwith area

Biggest number of sites with lots of historical mine structures and related infrastructure. Key bee sp. (Category A and B). St. Just Mining District (WHS) area has excellent sites. Key coastal and inland moor habitats off WHS. Moorland areas have a less species rich fauna but are are important for 2 very rare bees. Needs further assessment for key sites or assign as landscape area. Sennen cove, Gurnards Head and West Penwith moors.

8. South coast Western (Lizard)

Restricted good areas. Perranthuoe and Prussia cove, key bee (Category A and B) and mining landscape. Loe Bar, mine structures/related infrastructure and key bee site. Trewavas (WHS) excluded although some possible sites. Elsewhere on Lizard extremely good bee sites but few actual mine structures or features.

9 South coast Central (Dodman)
Moderate coastal bee diversity, with some key bee (Category A and B) species present. but poor historical features and poor mining infrastructure. Exclude most or all sites.

10 South coast Eastern (Fowey and Polperro)
A few key bee (Category A and B) species present. but poor historical features and poor mining infrastructure. Exclude most or all sites.

11 Rame head
Some coastal bee sites but poor historical features and poor mining infrastructure. Exclude most or all sites.

12 Bodmin moor
Key bee (Category A and B) species present. Caradon Mining District (WHS) has very good historical features and typical mining infrastructure and some good sites outside. Other mine sites across the moor, but many have poor historical features and less typical mining infrastructure remains. Key bees are a specialised fauna of bees with poorer species diversity than the coast. Common land makes delivery difficult. Needs more assessment.

4. Priority species for mine site project within the AONB

The table below shows priority species for mine site project. Some additional species considered scarce in Falk (Falk 1991) have not been included as modern reviews (Archer 2015) consider these species less threatened. The tables combine both conservation significance and linkage to a mine project.

Fig 3. Priority species for mine site project within the AONB

Key

Rarity and Status -National rarity status from (Archer 2015) and (Archer 2014) and Status from (Falk 1991). RDB = Red Data Book NS = Nationally Scarce. S.41 Section 41 species (Formerly Biodiversity Action Plan Species) (Jncc 2016)

Recording-How easy is it to record this species. All is a very distinctive bee. Expert means experienced bee recorder. Naturalist means identification requires general recorder with some experience of species identification . Nat/Pho means requires a Naturalist to take a photo and be confirmed by expert.

Iconic - Attractive looking or Interesting species likely to engage recorders and public.

Good link to mines- The species can be linked to features and habitats typical of the AONB mine sites

Category A. Species	**High Priority Bees**						
Common name	***Species name***	**Rarity 2015**	**Status 1991**	**Section 41.**	**Recording**	**Iconic species**	**Link to mines**
Tormentil Nomad Bee	*Nomada roberjeotiana*	Very rare	RDB		Nat/Pho	Yes	Some
Perkins Mining Bee	*Andrena rosae*	Very rare	RDB		Nat/Pho	Yes	
Long-horned Nomad Bee	*Nomada hirtipes*	Scarce	RDB		Expert		
Long-horned Bee	*Eucera longicornis*	Scarce	NS	S.41	All	Yes	Some
Cat's Ear Nomad Bee	*Nomada integra*	Scarce	NS		Nat/Pho		Some
Small Flecked Mining Bee	*Andrena coitana*	Scarce			Expert		
Broad faced Mining Bee	*Andrena proxima*	Scarce	RDB		Expert		
Large Scabious Mining Bee	*Andrena hattorfiana*	Scarce	RDB		Naturalist	Yes	
Flat-ridged Nomad Bee	*Nomada obtusifrons*	Rare	NS		Expert		
Buff-banded Mining bee	*Andrena simillima*	Rare	RDB		Expert		Yes
Moss Carder Bumblebee	*Bombus muscorum*			S.41	Nat/Pho	Yes	
Brown-banded Carder Bumblebee	*Bombus humilis*			S.41	Nat/Pho	Yes	
Tormentil Mining Bee	*Andrena tarsata*			S.41	Nat/Pho	Yes	Some

Category B. Species	**Moderate priority Bees**						
Common name	***Species name***	**Rarity 2015**	**Status 1991**	**BAP**	**Recording**	**Iconic species**	**Link to mines**
Hawk's-beard Mining Bee	*Andrena fulvago*	Scarce	NS		Naturalist	Yes	Some
Black-headed Mining Bee	*Andrena nigriceps*	Scarce	NS		Nat/Pho		
Red-backed Mining Bee	*Andrena similis*	Scarce	NS		Expert		
Margined Colletes	*Colletes marginatus*	Scarce	NS		Nat/Pho		
Tiger-beetle Wasp	*Methocha articulata*	Scarce	NS		All		Yes
A solitary mining bee	*Andrena pilipes sens. lat.*	Scarce	NS		All		
Black-headed Leafcutter Bee	*Megachile circumcincta*	Scarce			Nat/Pho ?		
Green-eyed Flower Bee	*Anthophora bimaculata*	Restricted			All	Yes	Yes
The Silvery Leafcutter Bee	*Megachile dorsalis*	Restricted	NS		Naturalist	Yes	

Category C. Species	**Common bees for recording scheme**						
Common name	***Species name***	**Rarity 2015**	**Status 1991**	**BAP**	**Recording**	**Iconic species**	**Link to mines**
Black-horned Nomad Bee	*Nomada rufipes*				Nat/Pho		Yes
Heather Colletes	*Colletes succinctus*				Nat/Pho		Yes
Cliff Mining Bee	*Andrena thoracica*				All	Yes	
Clover Mellita	*Melitta leporina*				Naturalist	Yes	
Large Shaggy Bee	*Panurgus banksianus*				All	Yes	Yes
Gold-fringed Mason Bee	*Osmia aurulenta*				All	Yes	
Ashy Mining Bee	*Andrena cineraria*				All	Yes	
Hairy Footed Flower Bee	*Anthophora plumipes*				All	Yes	
Sand Tailed Digger Wasp	*Cerceris arenaria*				All	Yes	
Short Heath Bumblebee	*Bombus jonellus*				All	Yes	Yes
Wool Carder Bee	*Anthidium manicatum*				All	Yes	Some
Blue Ruby tailed wasp	*Trichrysis cyanea*				All	Yes	Perhaps

5. The conservation priorities for mine sites within the AONB

Influence management on high value sites in the focus areas

Advisory partnership, liaising with site owners and survey/monitoring by project officer. Possibly some volunteer groups with scrub control.

Create new "bee meadows" in proximity to focus areas

The project should aim to establish new bee meadows within flight range of focus areas or high value sites (100m - 1000m). These bee meadows will either be mixed species haymeadows or in some cases specifically targetted for key species. Using Plantlife (Plantlink 2011) best practice for planting schemes.

Comment; The most important issue for bees is usually lack of flowers both on high value sites and in the wider landscape way beyond any of the other factors affecting bee populations.

There has been a large amount of research into the practical creation of wildflower grassland and pollen and nectar margins (Nowakowski Et. Al. 2016). The project should work on suitable sites with local provenance wildflower plugs. The project will work with Heaven Scent nursery. The project could also work on larger sites creating flower-rich habitats with brush collected seed or green hay from local meadows.

The Ashy Mining Bee (P. Saunders)

6.1. Conservation and community participation plan

Whole area projects

- **Iconic bees of mine sites recording**
  Public participation in recording iconic bees (website recording portal)

- **Monitor sites and advise site managers**
  Further survey of resource. Overlap with work on focus areas. Link with existing partners NE, NT and FWAG, try to influence existing schemes or ensure new CS schemes peripheral to key sites are suitably targetted.

- **Buff-banded Mining bee survey Andrena simillia**
  This bee is very rare with stronghold within project area. This bee has unknown habitat requirements. Small study collecting pollen.

Focus area (Bee mine hot spots) projects

In 14 bee mine hot-spots (or clusters of important mine sites in focus areas). Pick on pragmatic basis after contacting relevant partners/landowners/site managers of key sites.

- **Bee mine management agreement or management advice**
  Advisory. Most important sites such as NT or SSSI'S. Where possible implement management agreements to influence existing site plans or grazing arrangements.

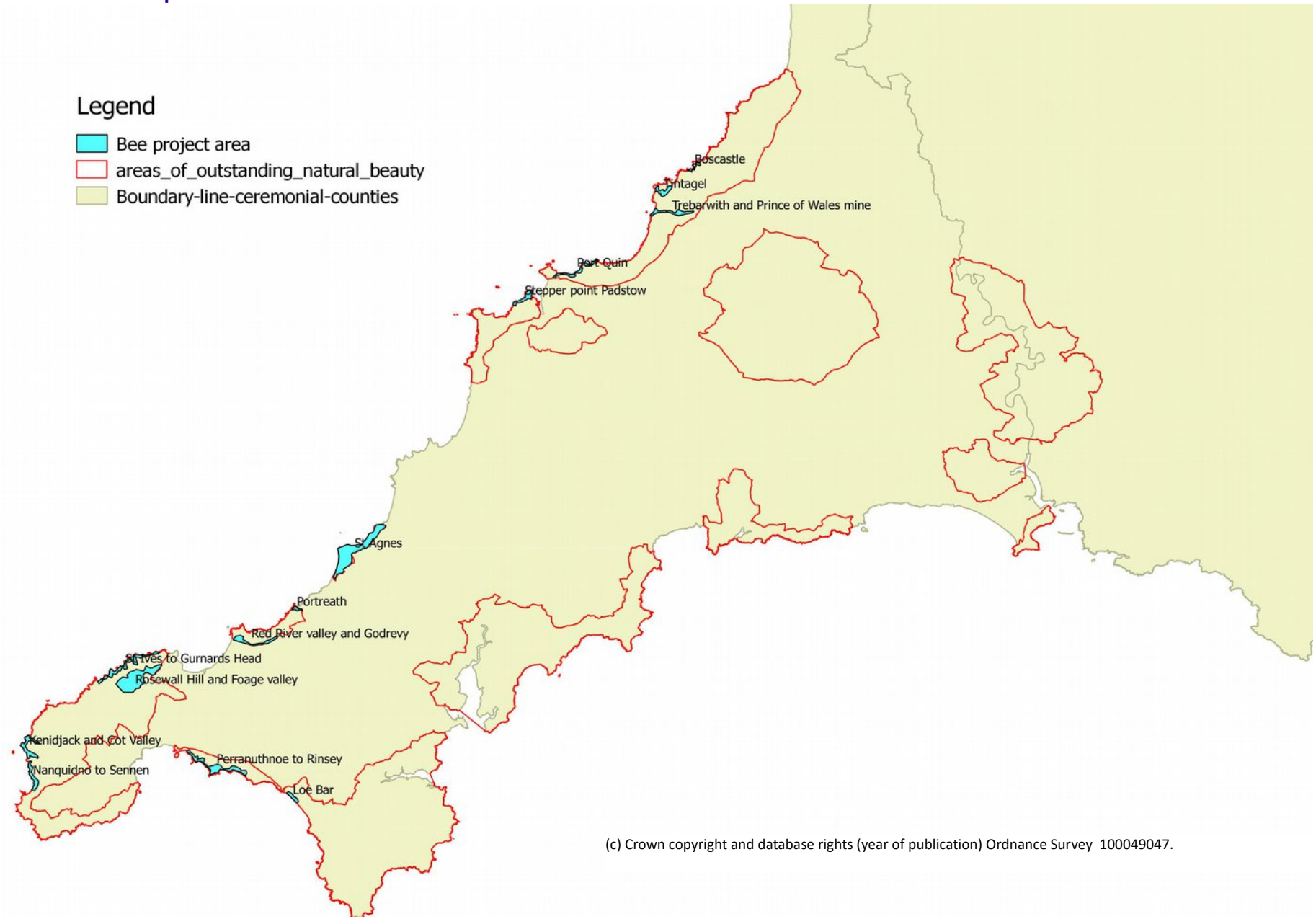
- **New bee meadows**
  Small scale community sites and public spaces or bigger sites on farmland. Mainly work with Heaven Scent nursery. High scope for communities to engage with growing through partnership with Heaven Scent nursery (Duchy College, Wheal Martin)

- **Adopt a mine or coordinate local groups**
  Mostly scrub cutting or some planting for buffer zones. Will be better to use existing organisations and contacts, and request volunteers only when needed, rather than directly managing a volunteer group.

6.2. Focus areas (Bee mine hot spots)

id	Focus area	Bee meadow	Comment
1	Tintagel	Y	Very good diversity of key species. Near busy tourist site. Some mining heritage, but no above ground features left, Some former mine sites in town
2	Bocastle	Y	Very good diversity of key species. Andrena simillа key focus. Near busy tourist site. Mining heritage poor but quarries important
3	Port Quin	Y	Very good diversity of key species. Remote location. Some mining heritage, but poor in obvious above ground features.
4	Stepper point Padstow	Y	Very good diversity of key species. Some mining heritage, some features left. Busy tourist site
5	St Agnes	Y	Very good diversity of key species. Large area with huge number of typical mining structures. Within WHS. Close to Truro and Redruth to engage public plus has an obvious link to Cornwall's Mining Heritage
6	Portreath	Y	Good diversity of key species. Small area. Good link to mining. Near residential area.
7	Red River valley and Godrevy	Y	Scabious bee key focus area. Other species present. Good link to mining heritage in Red River. Busy tourist area
8	Nanquidno to Sennen	Y	Good diversity of key species. Possible Long horned focus. Moderate link to mining although most obvious mine sites sites in WHS outside focus area. Busy tourist areas although some sections remote.
9	St Ives to Gurnards Head	Y	Good diversity of key species but further survey needed. Very good mining heritage with engine houses. Some setions close to St.Ives others more remote.
10	Rosewall Hill and Foage valley	N	Andrena Rosae focus, Tormentil nomad also. Very good mining heritage. Some areas near residential areas, others remote.
11	Perranuthnoe to Rinsey	Y	Long-horned focus area. Very good link to mining. Near residential areas. Public engagement through Penzance and Helston. Smaller communities stretched out alongside. Mostly intensive agriculture.
12	Loe Bar	Y	Some diversity of key species. Very Good link to mining. Near residential areas. Porthleven. Small area.
13	Trebarwith and Prince of Wales mine	Y	Good diversity of key species. Some link to mining. Coast busy for tourists but remote otherwise
14	Kenidjack and Cot valley	Y	Long-horned focus area. Very good link to mining. Access moderate. Near St Just. Good potential for community/schools. May be worth including Cot valley and linking with Sennen.

Fig 5. Focus areas map



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