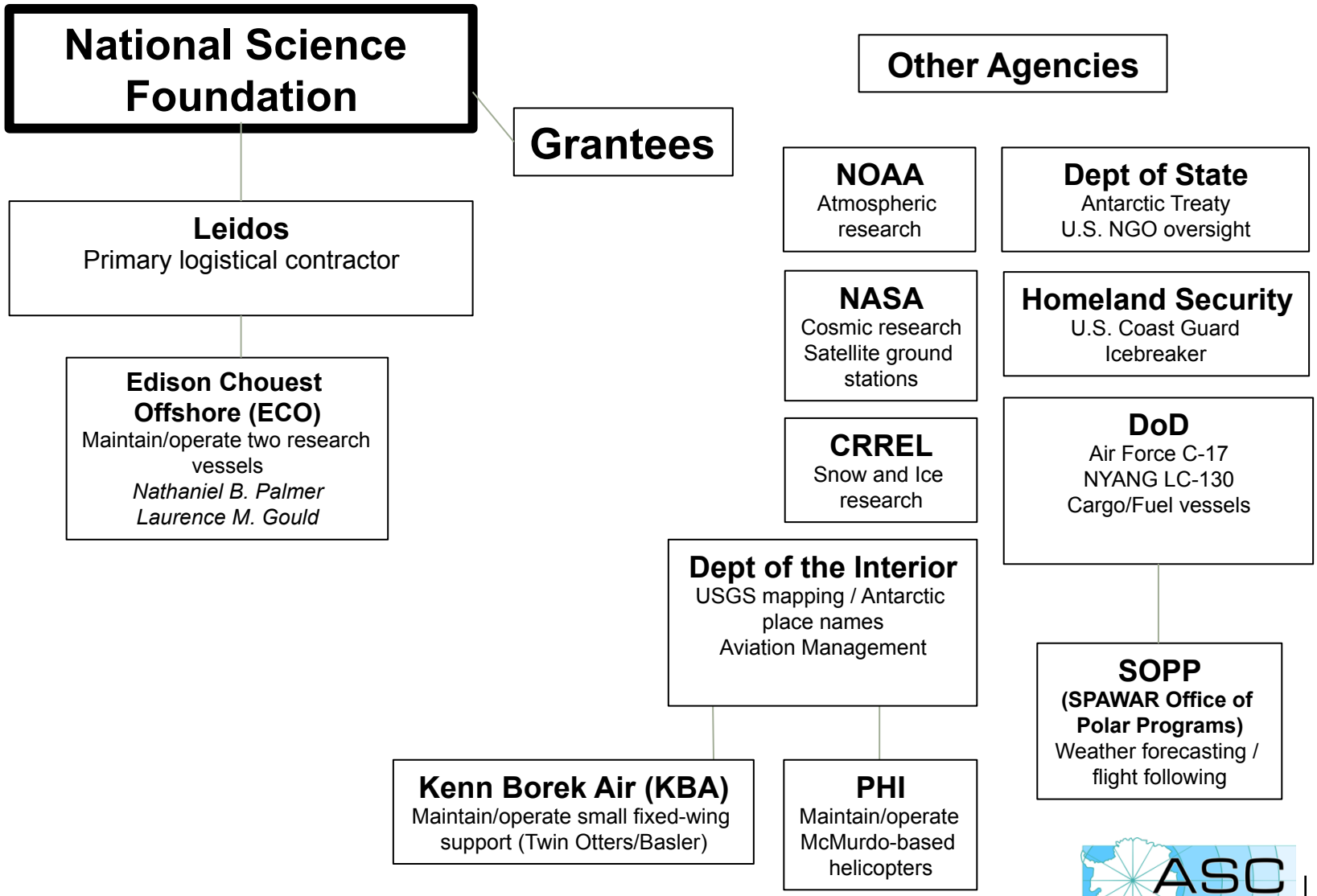
Operations in the Southern Ocean

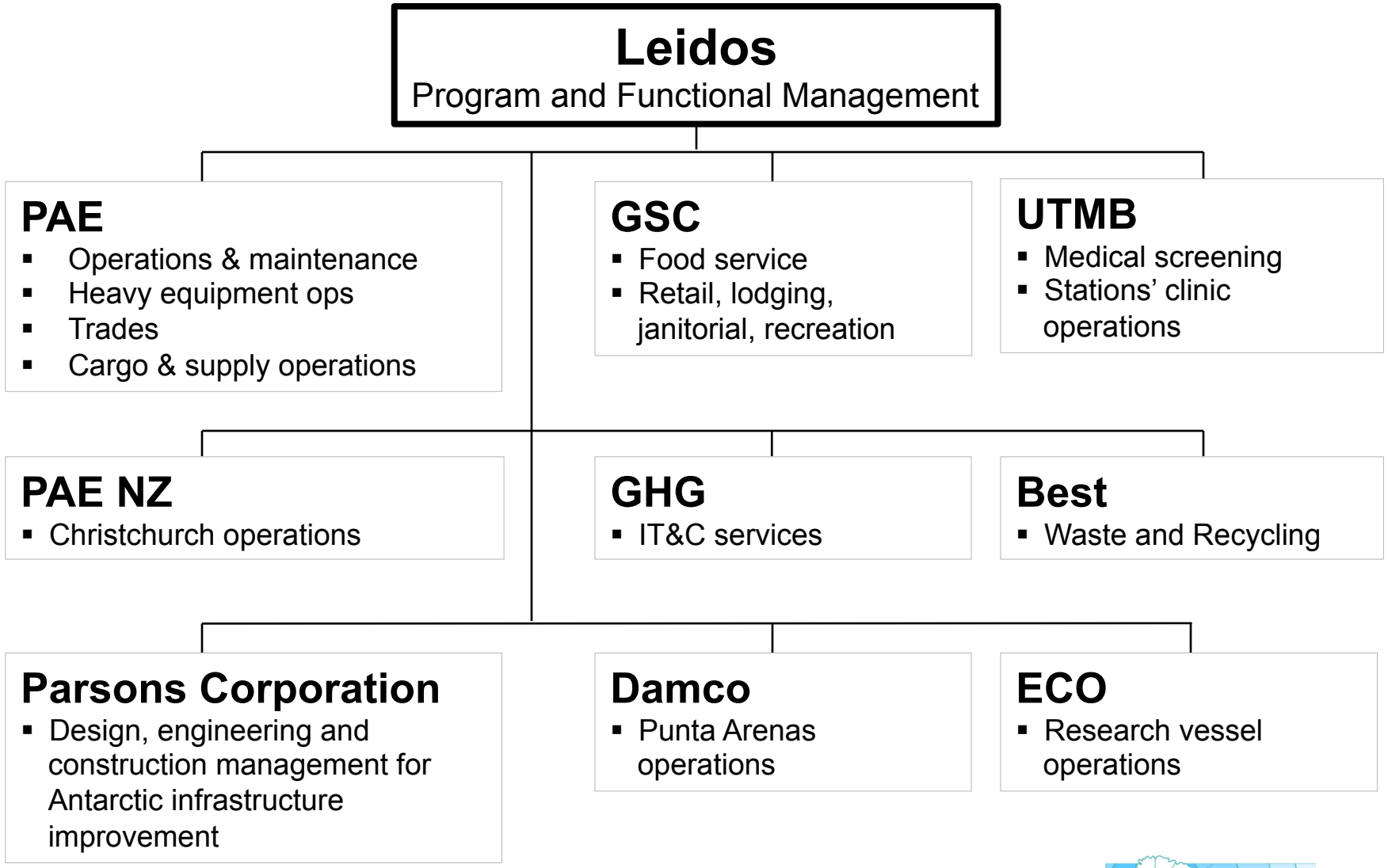
US Antarctic Program

- **National Science Foundation** manages the US Antarctic Program (USAP)
  - **100+** science projects / yr
  - **3,000** people to/from US stations / yr
  - **3** stations, **2** ships, many field camps

USAP Organization



Antarctic Support Contract



ASC Locations

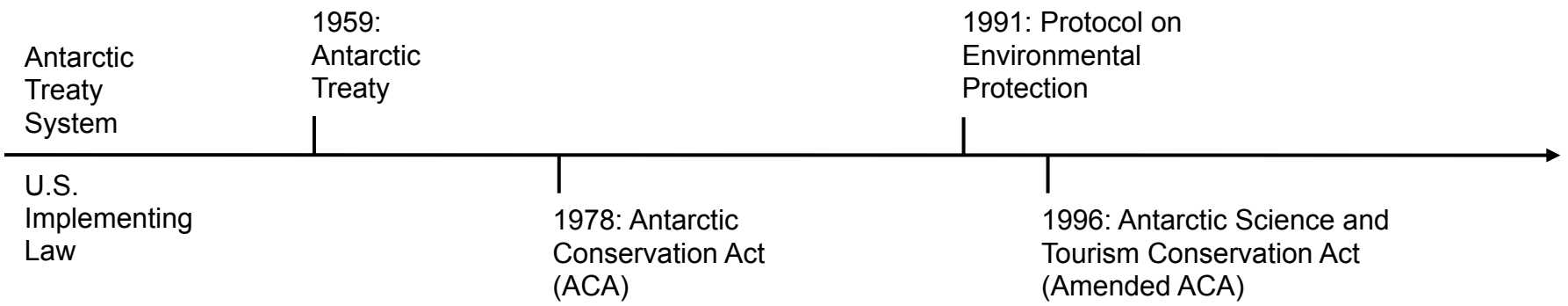
Centennial, CO - ASC Headquarters

Alexandria, VA - Science Planning
Galveston, TX - Medical (UTMB)
Port Hueneme, CA - Logistics

Santiago, Chile – Logistics
Punta Arenas, Chile – Warehouse, clothing, logistical support

Christchurch, New Zealand – Warehouse, clothing, logistical support

Environmental Policy & Regulatory Drivers



- The **Antarctic Treaty/Protocol** provides the overall governance framework for Antarctica and all area south of 60°. Domestically, the Antarctic Treaty and the Environmental Protocol is implemented through the Antarctic Conservation Act
- The **Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR)** manages and regulates commercial harvesting, and conducts marine ecosystem management

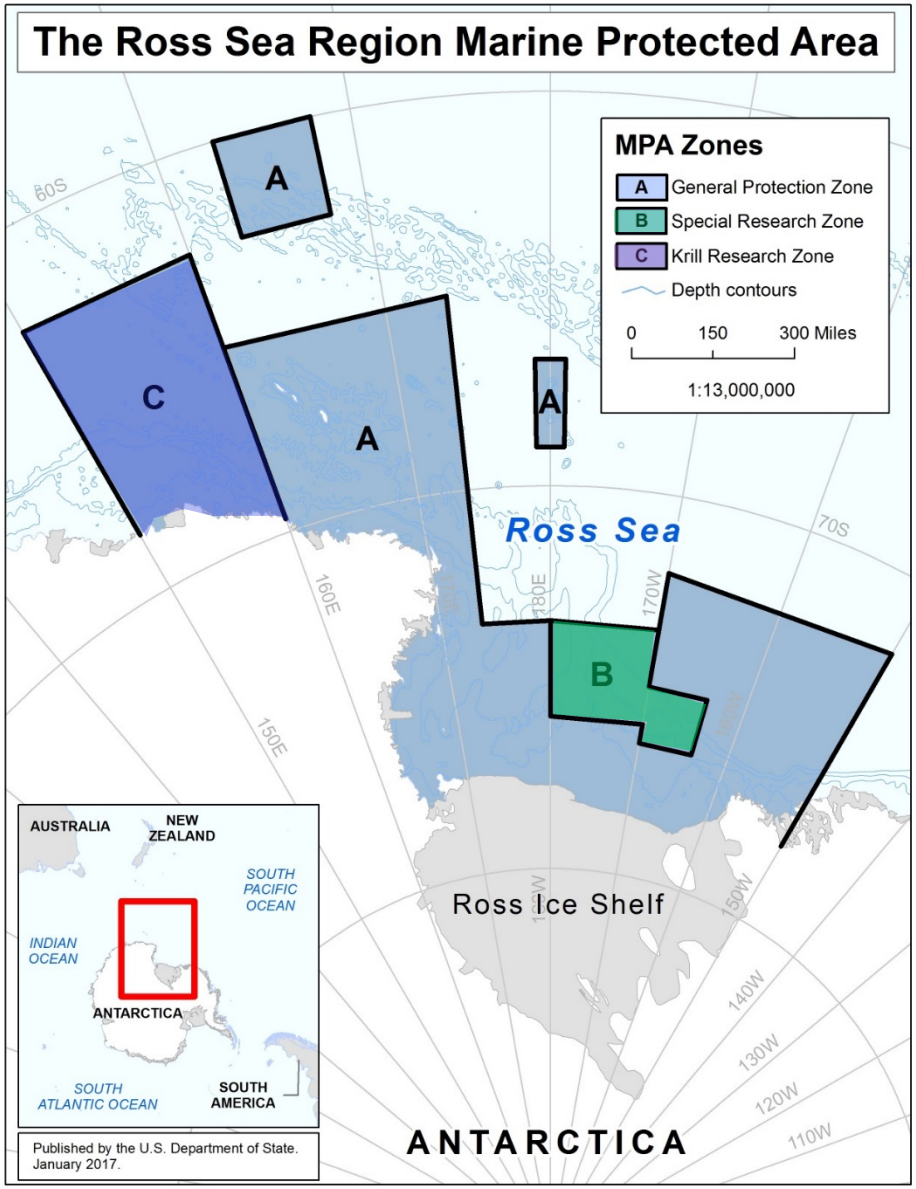
The Antarctic Conservation Act

The Antarctic Conservation Act (ACA) of 1978, as amended, 16 U.S.C 2401 et seq.

Implements the six annexes of the Environmental Protocol

1. **Environmental Impact Analysis** - Requires all activities to be reviewed for environmental impacts (Annex I)
2. **Conservation** - Protects flora and fauna (Annex II)
3. **Waste** - Requires all solid and hazardous waste be sorted and removed from the continent (Annex III) and requires strict management of all hazardous substances, such as fuel
4. **Marine Pollution Prevention** – adoption of MARPOL annexes (Annex IV)
5. **Protected Areas** - Designates Antarctic Specially Protected Areas (ASPAs) and Antarctic Specially Managed Areas (ASMAs) – (Annex V)
6. **Liability** - for Environmental Emergencies (Annex VI)

Ross Sea Marine Protected Area (MPA)



Facts

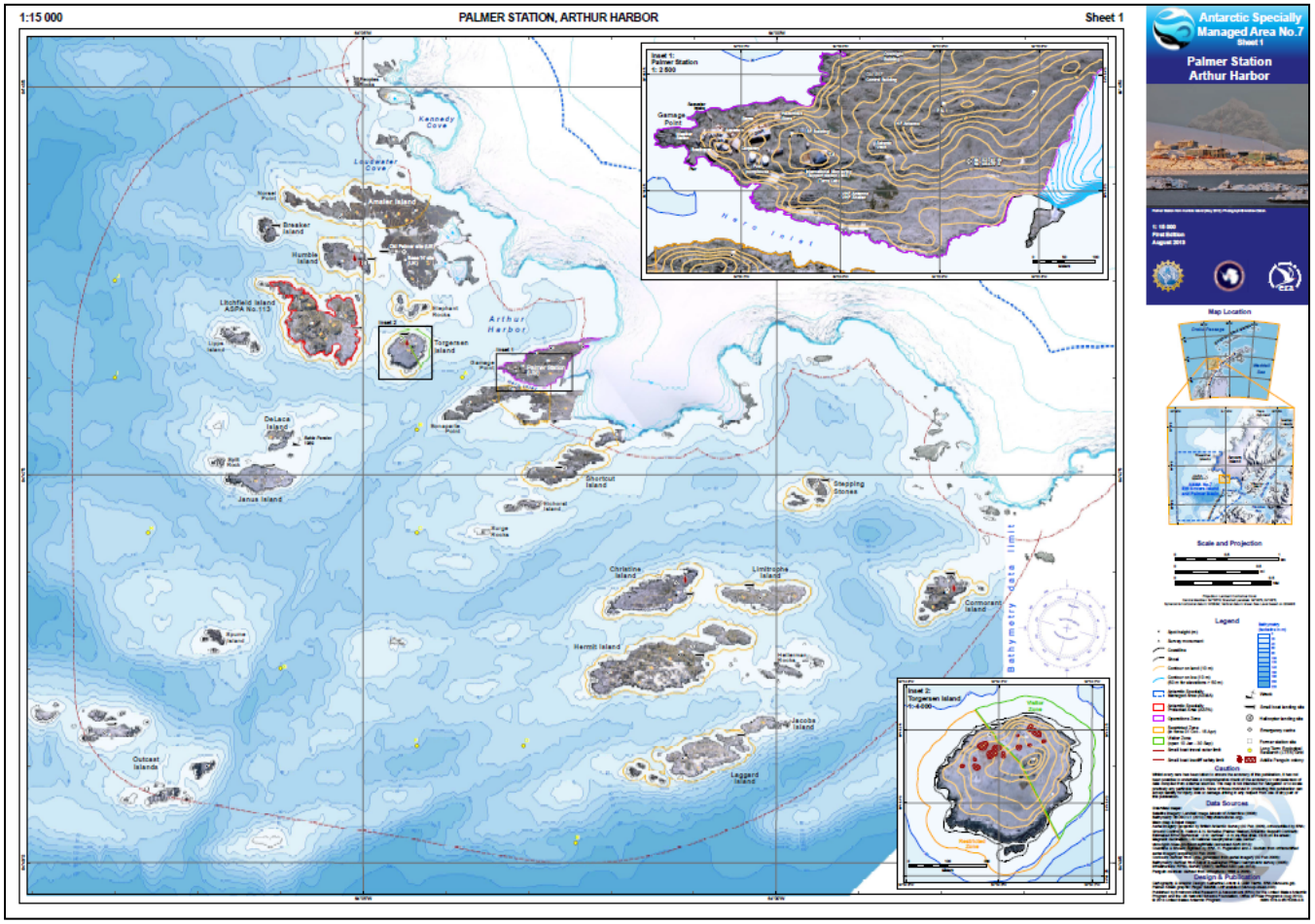
- Adopted: Oct 2016 (CCAMLR)
- Enters into force: Dec 2017
- Size: ~600,000 mi^2
- GPZ (A) – no commercial fishing allowed (72% of MPA)
- SRZ (B) – limited fishing allowed (7% of MPA)
- KRZ (C) – regulated krill fishing only (21% of MPA)
- Large, ecologically varied, and productive marine ecosystem
- Put forth by US and NZ (2012), formally

Southwest Anvers Island / Palmer Basin Antarctic Specially Managed Area (ASMA)

Example Marine ASMA

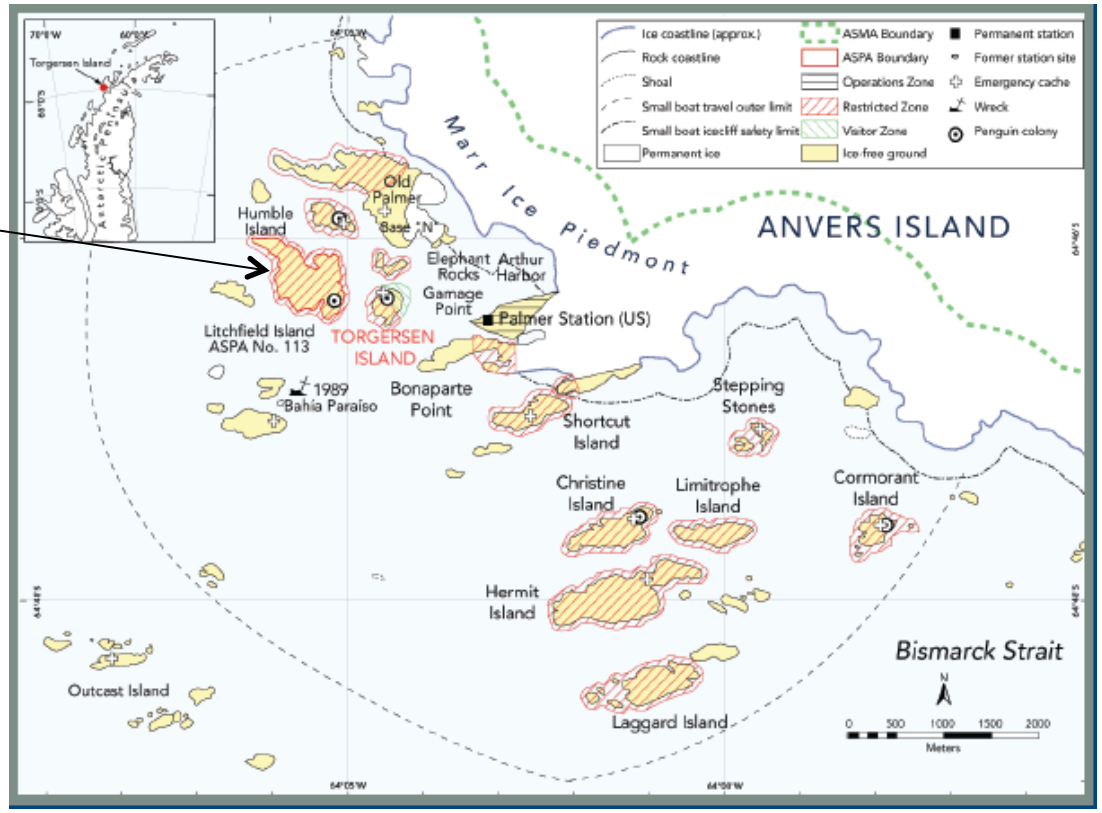
Palmer ASMA
Adopted in 2008

- Creates guidelines for science, tourism and other activities to conserve and protect the unique environment surrounding Palmer Station
- Purpose is to effectively manage and coordinate potentially conflicting interests activities in the area.



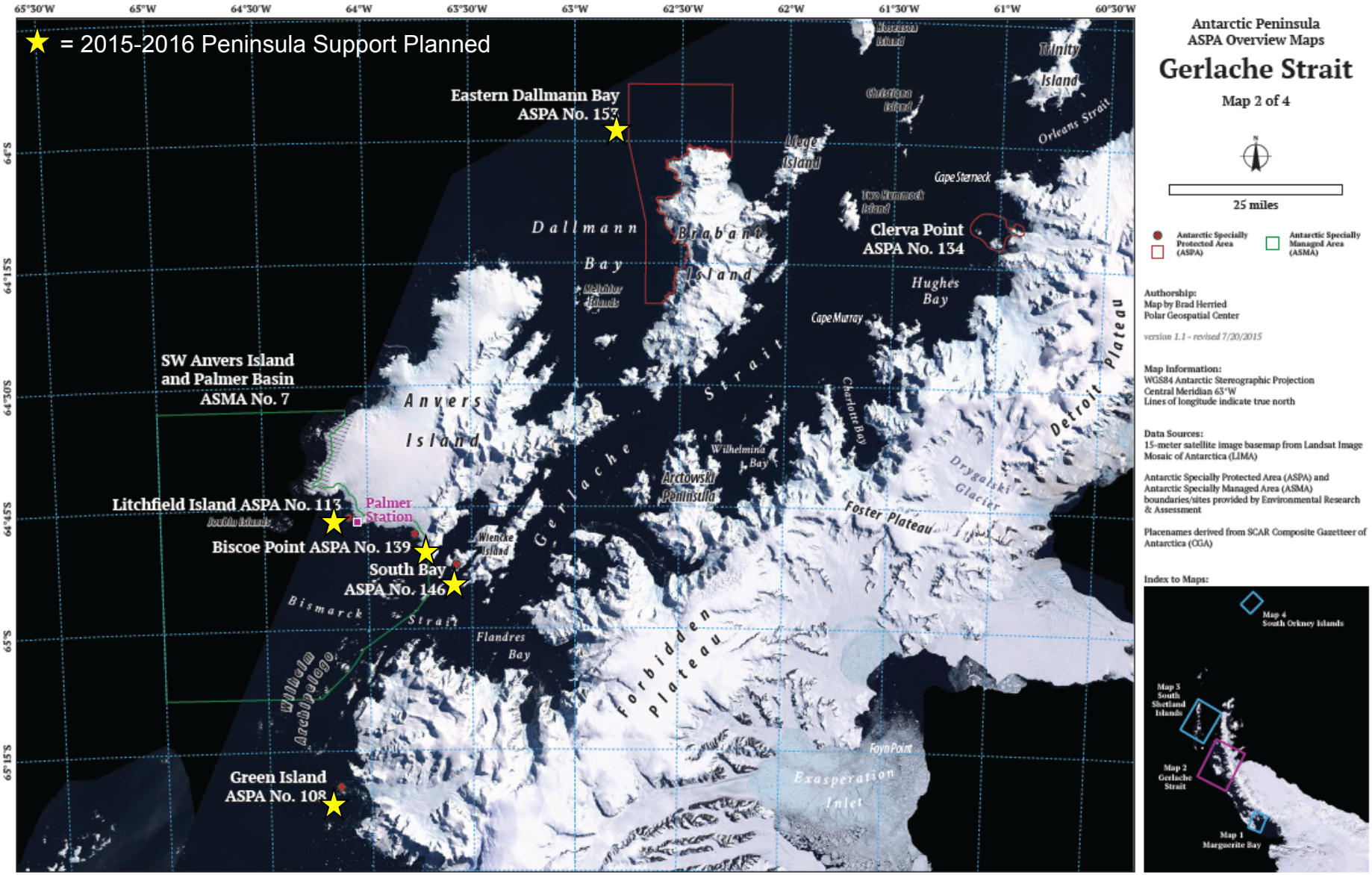
Palmer Area
Antarctic Specially Protected Areas (ASPAs)

- **ASPAs require a permit to enter.** Example ASPAs near Palmer Station:
  - **Litchfield Island (ASPA 113).**
  - **Biscoe Point (ASPA 139)**
  - **South Bay, Doumer Island (ASPA 146),.**
- **Your name must be on the permit to use it.**
- **Keep a copy of your permit with you whenever inside an ASPA**



http://www.ats.aq/siteguidelines/documents/Torgersen_rev_e.pdf

Marine ASPA Map –Gerlache Straight example



Antarctic Peninsula
ASPA Overview Maps

Gerlache Strait

Map 2 of 4

25 miles

Antarctic Specially Protected Area (ASPA)

Antarctic Specially Managed Area (ASMA)

Authorship:
Map by Brad Herried
Polar Geospatial Center

version 1.1 - revised 7/20/2015

Map Information:
WGS84 Antarctic Stereographic Projection
Central Meridian 63°W
Lines of longitude indicate true north

Data Sources:
15-meter satellite image basemap from Landsat Image Mosaic of Antarctica (LIMA)

Antarctic Specially Protected Area (ASPA) and Antarctic Specially Managed Area (ASMA) boundaries/sites provided by Environmental Research & Assessment

Placenames derived from SCAR Composite Gazetteer of Antarctica (CGA)

Index to Maps:

USAP Environmental Practices Affecting Ships

Conservation of Flora and Fauna

“Non-Native Species”

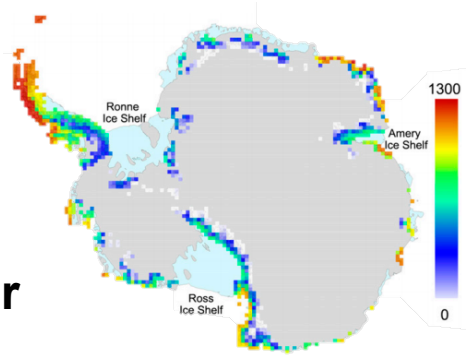
- Those species that do not naturally occur in Antarctica and have been introduced either intentionally or unintentionally.
- In the sub-Antarctic non-native species have not only thrived but dominated or destroyed existing ecosystems
- Additionally, personnel cannot bring food-type non-native species (yogurt, spirulina, kombucha, beer yeast, etc)

Conservation of Flora and Fauna

As human activity in Antarctica increases, so do the associated invasive species risks

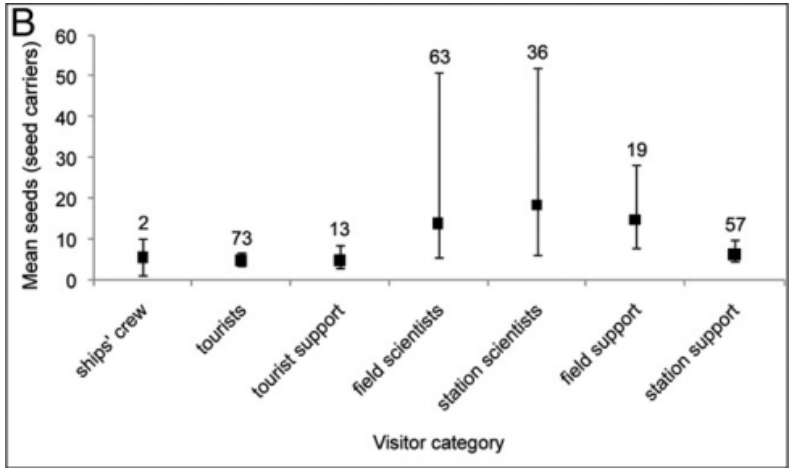
Before you leave Port:

1. Clean and examine clothes thoroughly
2. Pack new or clean gear



Once you've arrived in Antarctica:

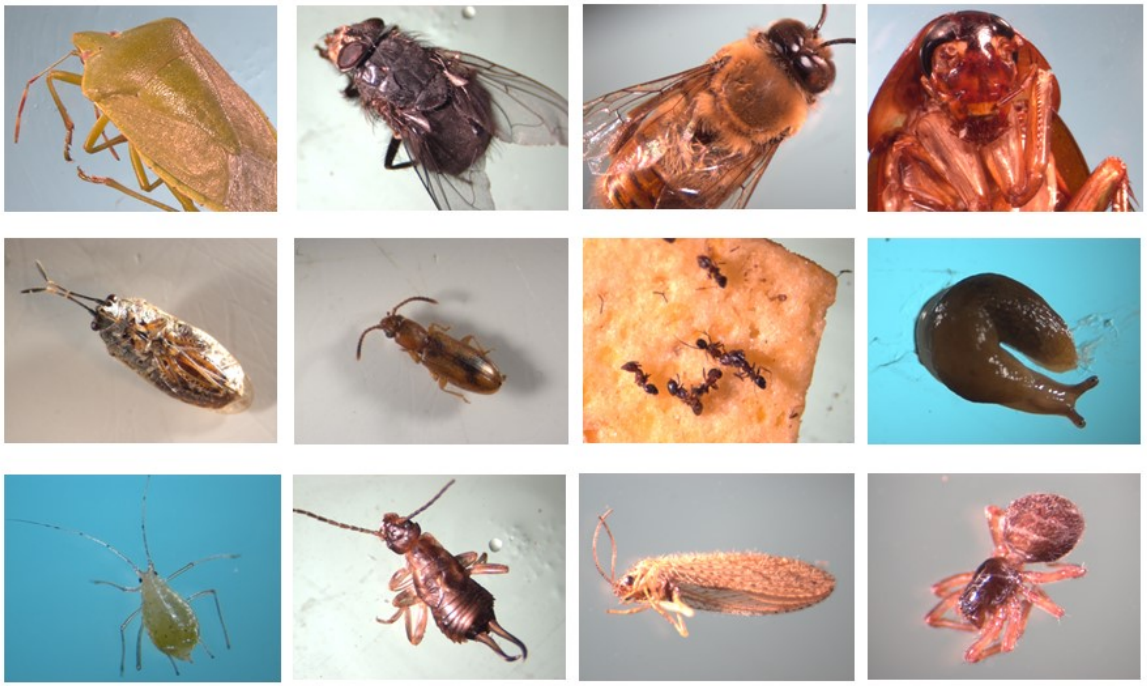
1. Clean your gear regularly
2. Report a pest
3. Follow cross-contamination prevention procedures



Chown et al. 2012, PNAS

Conservation of Flora and Fauna

Examples of non-natives located and identified in 16-17:



Thanks for your contributions!

Types of Non Native Species Observed in Antarctica:

Seeds, Grasses, Algae, Plant Material, Fruit Flies, Worms, Spiders, Midges, Microorganisms

Conservation of Flora and Fauna

The Vessel "Boot Wash" Station

- Minimizes terrestrial cross-contamination and distribution of non-natives on US research vessels before and after any shore landings.
- Should be used to clean boots, any soiled gear, walking sticks, yak traks, etc.

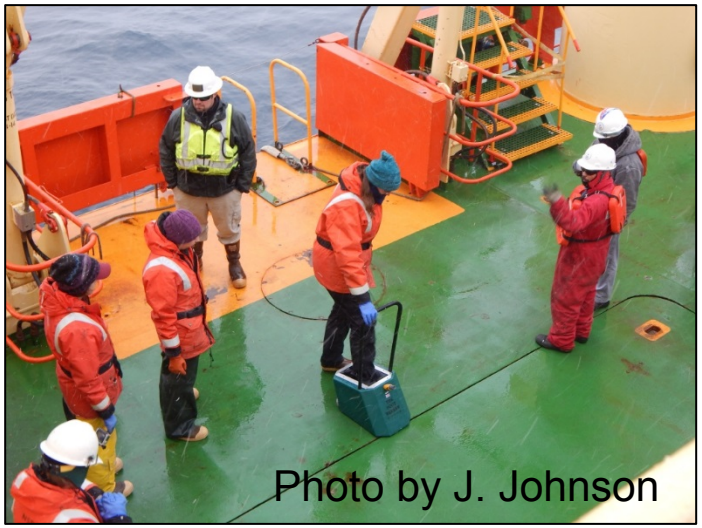


Photo by J. Johnson

Plastics in Antarctica and the Marine Environment

Microbeads

- USAP banned microbeads and microbead containing materials in November 2014
- That was more than a year ahead of the federal ban – the Microbead-Free Waters Act of 2015 was signed December 28, 2015

Marine Oil Spill Response

Marine Oil Spill Response

When ice conditions permit, preventative boom is deployed prior to all fuel transfers over water.

Environmental Reporting

Under the ACA:

REPORTING IS REQUIRED FOR ALL ENVIRONMENTAL RELEASES

- Whether intentional (science party release) or unintentional (lost hat).

- All deployed equipment must be tracked and recovered

HOW THE **POLAR** CODE PROTECTS THE ENVIRONMENT

OIL

DISCHARGES
Discharge into the sea of oil or oily mixtures from any ship is prohibited

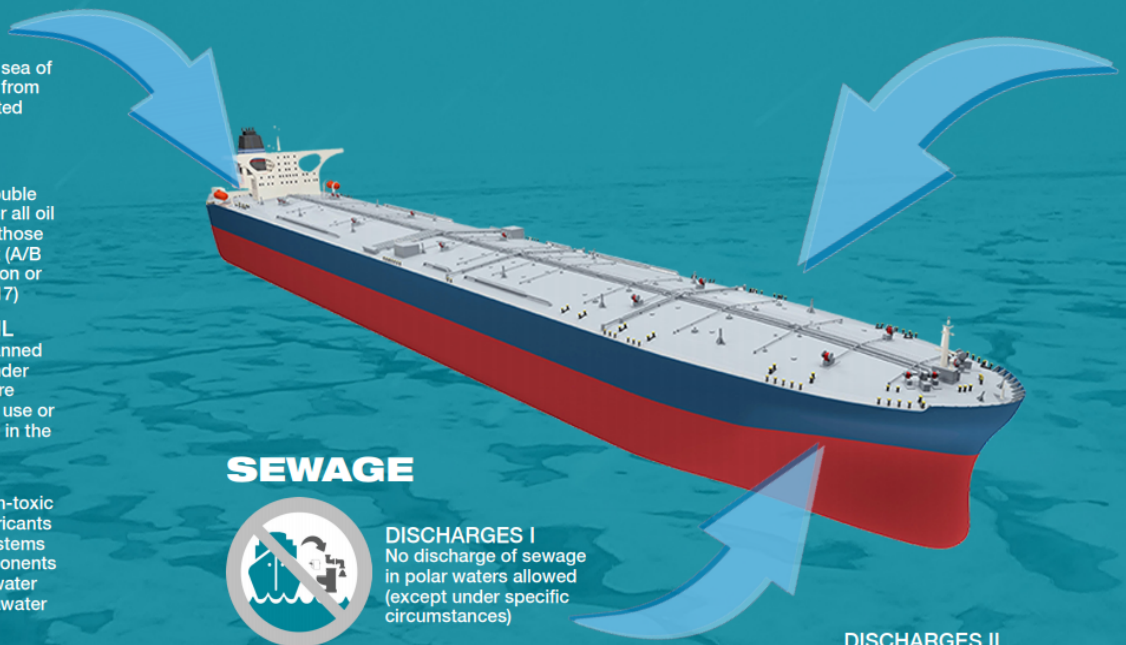
STRUCTURE
Double hull and double bottom required for all oil tankers, including those less than 5,000dwt (A/B ships constructed on or after 1 January 2017)

HEAVY FUEL OIL
Heavy fuel oil is banned in the Antarctic (under MARPOL). Ships are encouraged not to use or carry heavy fuel oil in the Arctic

LUBRICANTS
Consider using non-toxic biodegradable lubricants or water-based systems in lubricated components outside the underwater hull with direct seawater interfaces

INVASIVE SPECIES

INVASIVE AQUATIC SPECIES
Measures to be taken to minimize the risk of invasive aquatic species through ships' ballast water and biofouling



SEWAGE

DISCHARGES I
No discharge of sewage in polar waters allowed (except under specific circumstances)

TREATMENT PLANTS
Discharge is permitted if ship has an approved sewage treatment plant, and discharges treated sewage as far as practicable from the nearest land, any fast ice, ice shelf, or areas of specified ice concentration

DISCHARGES II
- Sewage not comminuted or disinfected can be discharged at a distance of more than 12nm from any ice shelf or fast ice
- Comminuted and disinfected sewage can be discharged more than 3nm from any ice shelf or fast ice

GARBAGE

PLASTICS
All disposal of plastics prohibited (under MARPOL)

FOOD WASTES I
Discharge of food wastes onto the ice is prohibited

FOOD WASTES II
Food wastes which have been comminuted or ground (no greater than 25mm) can be discharged only when ship is not less than 12nm from the nearest land, nearest ice shelf, or nearest fast ice

ANIMAL CARCASSES
Discharge of animal carcasses is prohibited

CARGO RESIDUES
Cargo residues, cleaning agents or additives in hold washing water may only be discharged if: they are not harmful to the marine environment; both departure and destination ports are within Arctic waters; and there are no adequate reception facilities at those ports. The same requirements apply to Antarctic area under MARPOL

CHEMICALS

DISCHARGES
Discharge of noxious liquid substances (NLS) or mixtures containing NLS is prohibited in polar waters

BACKGROUND INFO

- THE INTERNATIONAL CODE FOR SHIPS OPERATING IN POLAR WATERS WILL ENTER INTO FORCE ON 1 JANUARY 2017
- IT APPLIES TO SHIPS OPERATING IN ARCTIC AND ANTARCTIC WATERS: ADDITIONAL TO EXISTING MARPOL REQUIREMENTS
- IT PROVIDES FOR SAFE SHIP OPERATION AND PROTECTS THE ENVIRONMENT BY ADDRESSING THE UNIQUE RISKS PRESENT IN POLAR WATERS BUT NOT COVERED BY OTHER INSTRUMENTS

DEFINITIONS

SHIP CATEGORIES
Three categories of ship designed to operate in polar waters in:
A) at least medium first-year ice
B) at least thin first-year ice
C) open waters/ice conditions less severe than A and B

FAST ICE: Sea ice which forms and remains fast along the coast, where it is attached to the shore, to an ice wall, to an ice front, between shoals or grounded icebergs

ICE SHELF: A floating ice sheet of considerable thickness showing 2 to 50m or more above sea-level, attached to the coast

IMO INTERNATIONAL MARITIME ORGANIZATION

New Polar Research Vessel Design Considerations

- Waste Water Hold
- Fuel Eff
- Air Em
- Envi Safe Oils
- Other?