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

National Science Foundation

Leidos
Primary logistical contractor

Edison Chouest Offshore (ECO)
Maintain/operate two research vessels
Nathaniel B. Palmer
Laurence M. Gould

Grantees

NOAA
Atmospheric research

NASA
Cosmic research
Satellite ground stations

CRREL
Snow and Ice research

Dept of the Interior
USGS mapping / Antarctic place names
Aviation Management

Kenn Borek Air (KBA)
Maintain/operate small fixed-wing support (Twin Otters/Basler)

PHI
Maintain/operate McMurdo-based helicopters

Other Agencies

Dept of State
Antarctic Treaty
U.S. NGO oversight

Homeland Security
U.S. Coast Guard Icebreaker

DoD
Air Force C-17
NYANG LC-130
Cargo/Fuel vessels

SOPP
(SPAWAR Office of Polar Programs)
Weather forecasting / flight following

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Antarctic Support Contract

**Leidos**
Program and Functional Management

**PAE**
- Operations & maintenance
- Heavy equipment ops
- Trades
- Cargo & supply operations

**PAE NZ**
- Christchurch operations

**Parsons Corporation**
- Design, engineering and construction management for Antarctic infrastructure improvement

**GSC**
- Food service
- Retail, lodging, janitorial, recreation

**GHG**
- IT&C services

**Best**
- Waste and Recycling

**UTMB**
- Medical screening
- Stations’ clinic operations

**Damco**
- Punta Arenas operations

**ECO**
- Research vessel operations
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 (ASPA)

- 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

Marine ASPA Map – Gerlache Straight example

= 2015-2016 Peninsula Support Planned

Antarctic Peninsula ASPA Overview Maps

Gerlache Strait
Map 2 of 4

Antarctic Specially Protected Area (ASPA)

Authoritative:
Map by Endre Herried
Polar Geospatial Center
version 1.1 - revised 7/20/2015

Map Information:
WGS84 Antarctic Stereographic Projection
Central Meridian 65°W
Lines of longitude indicate true north

Data Sources:
IT-escr satellite image base map from LandSat Image
Nominat of Antarctica (LBA)
Antarctic Specially Protected Area (ASPA) and
Antarctic Specially Managed Area (ASMA)
boundaries/data provided by Environmental Research
& Assessment

Index to Maps:

1. Map 1 - South Orkney Islands
2. Map 2 - Gerlache Strait
3. Map 3 - Smith Island

Green Island ASPA No. 108
Biscoe Point ASPA No. 139
South Bay ASPA No. 146
Litchfield Island ASPA No. 117
SW Anvers Island and Palmer Basin
ASMA No. 7

Eastern Dallmann Bay
ASPA No. 157

Clerva Point
ASPA No. 134

Palmer Station

Palmer Island

Flandres Bay

Exasperation Inlet

Forsland

Wohlgemuth

Bismarck Strait

Wilhelmina

Anvers Island

Bismarck

Cape Oranje

Cape Hallett

Nelson Island

Moby Dick

Minery Island

Orleans Strait

Cape Mercy

Hughes Bay

Hallett

Forsland Plateau

Detriot Plateau

Dallmann Bay

Brabant Island

Columbia Island

Biscareau Island
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:

Types of Non Native Species Observed in Antarctica:
Seeds, Grasses, Algae, Plant Material, Fruit Flies, Worms, Spiders, Midges, Microorganisms

Thanks for your contributions!
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

![Image of people in a water treatment plant](Photo by J. Johnson)
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 5,000 dwt (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 the 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.

**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 the ship is not less than 12m 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.

**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.
- 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 ships 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.

**CHEMICALS**
- **DISCHARGES**
  - Discharge of noxious liquid substances (NLS) or mixtures containing NLS is prohibited in polar waters.
New Polar Research Vessel Design Considerations

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