Waterfowl Surveys

Monitoring for Management

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Surveys

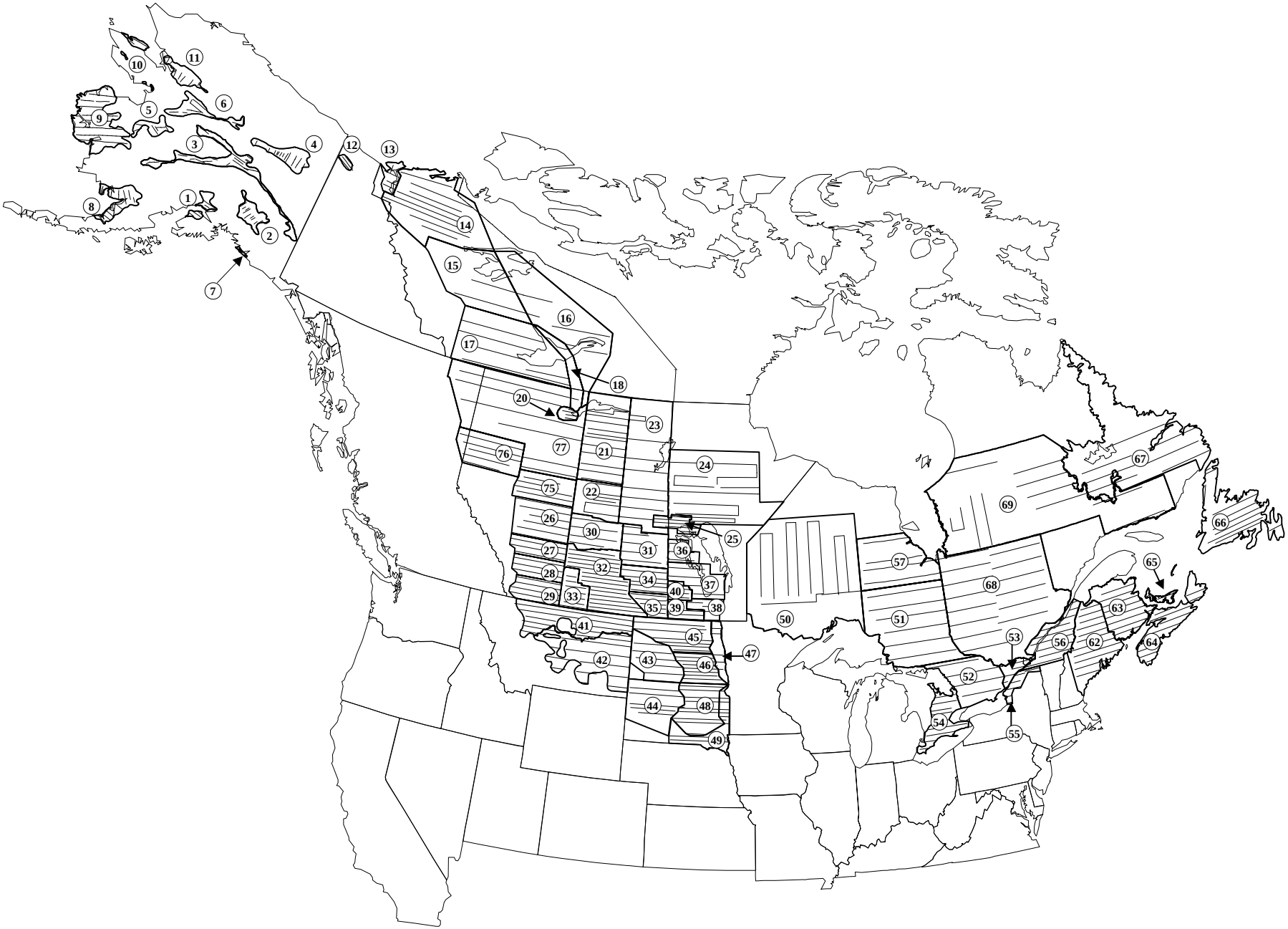
- Population abundance
- Vital rate estimation
- Productivity
- Harvest estimation

Ducks and Geese

Estimation of Abundance
-relative and absolute

May Aerial Survey
Breeding ducks

Undoubtedly the most extensive survey of any group of animals anywhere in the world



Transects and strata for areas of the Breeding Waterfowl and Habitat Survey (Traditional and Eastern).

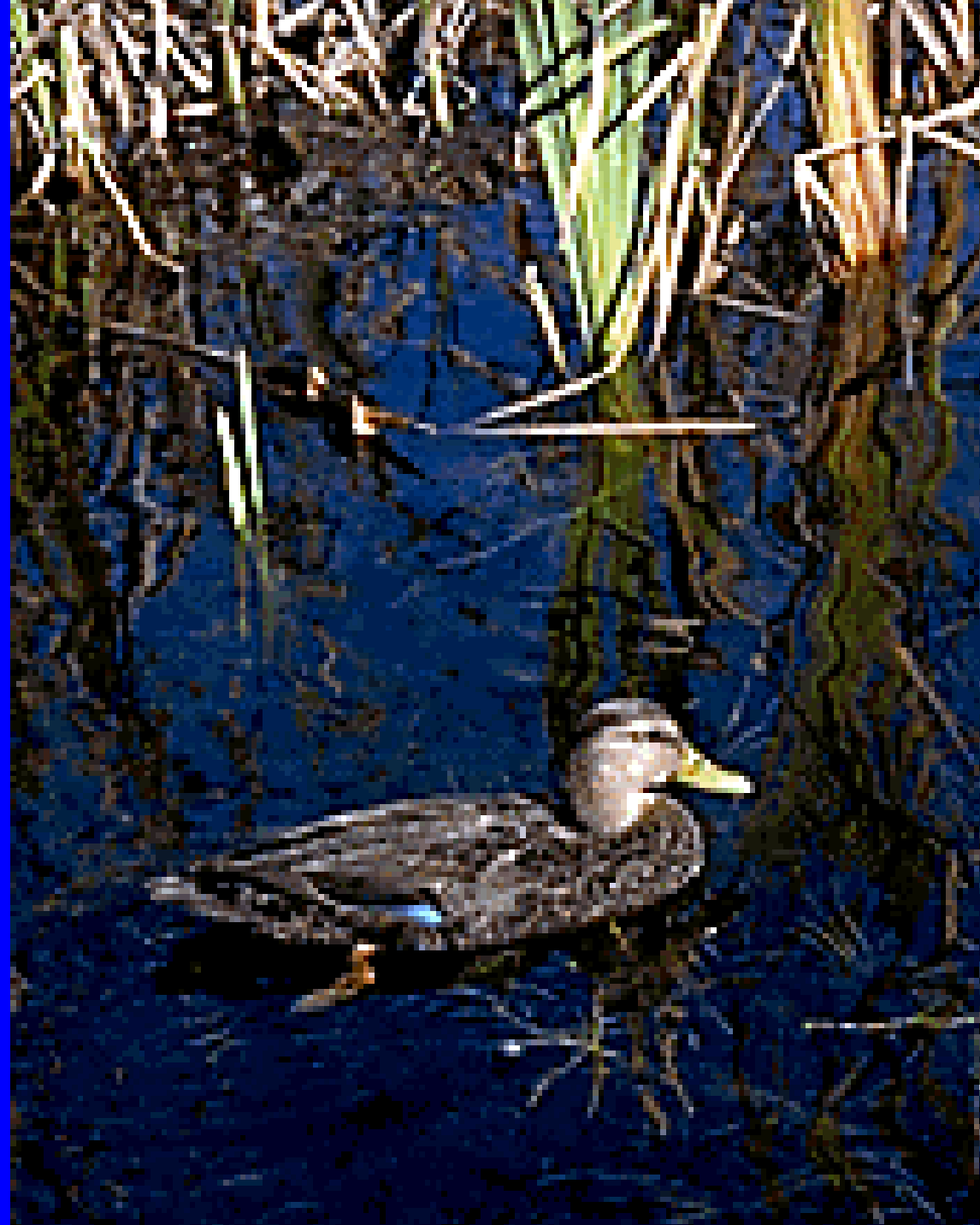
May Aerial Survey

- 1955 to present – traditional survey area
- 1994-98 to present – Eastern Canada
- 1962 ponds in prairie & parkland Canada
- 1974 ponds in north-central US
- 1994 ponds in former stratum 19 – now 75, 76 & 77

Expansion into Eastern Canada –

Black Duck Joint Venture

Management of the Black Duck and Atlantic Flyway harvest based on assessments of “local” stocks – not mid-continent mallards



MAS procedures

- Survey protocol
  - Systematic survey along established transects
  - Spaced across strata
  - Count ducks from fixed wing plane
  - Flown at 100 ft off ground or trees
  - Recent years – GPS locations for each observation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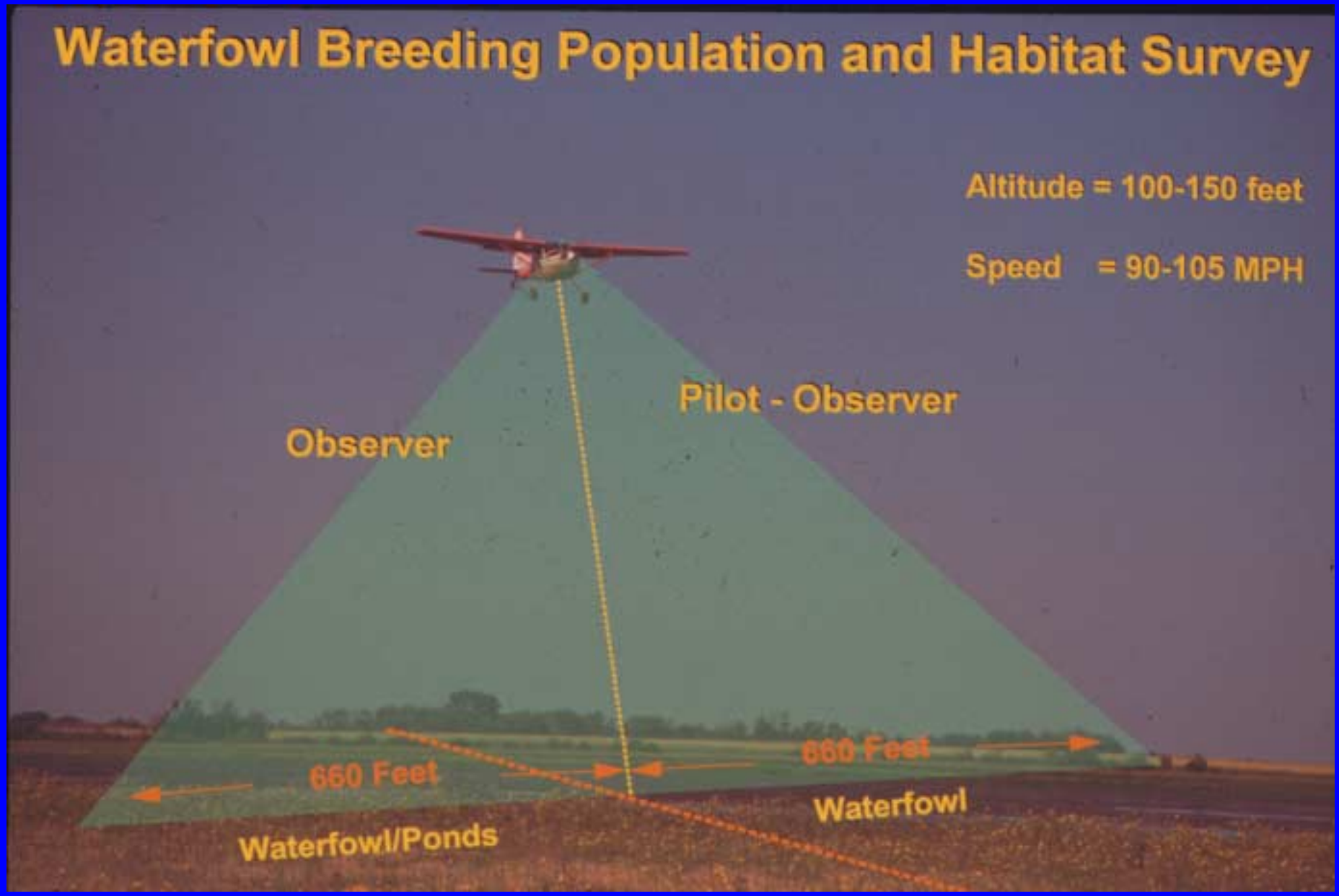
Waterfowl Breeding Population and Habitat Survey
Altitude = 100-150 feet
Speed = 90-105 MPH
Pilot - Observer
Observer
660 Feet
660 Feet
Waterfowl
Waterfowl/Ponds

MAS & Visibility considerations

- Visibility correction 1958 to present
- Ground counts in prairies and parklands
- Some helicopter counts in boreal forest
- Accounts for birds missed by aerial crew
- Double sampling scheme – precision price

$$\hat{Y}_T = \sum_{c=1}^{C} \sum_{j=1}^{J_c} A_{cj} \hat{B}_{cj} \hat{R}_c$$

$$\hat{R}_c = \frac{\sum_{j=1}^{k} y_j}{\sum_{j=1}^{k} x_{2j}}$$

$$\hat{V}_{(\hat{Y})} = A^2\left(\hat{R}^2\hat{V}_{(\hat{B})} + \hat{B}^2\hat{V}_{(\hat{R})} - \hat{V}_{(\hat{B})}\hat{V}_{(\hat{R})}\right)$$

$$\hat{V}_{(\hat{B})} = \frac{1}{\bar{m}^2}\left[\sum_{i=1}^{n} x_{i1}^2\right]/n(n-1)$$

$$\hat{V}(\hat{R}) = \left[\frac{1}{\sum_{j=1}^{k} \frac{x_{2j}}{k}}\right]^2 \left[\sum_{j=1}^{k}(y_j)^2 - 2\hat{R}\sum_{j=1}^{k}(x_{2_j})(y_j) + R^2\sum_{j=1}^{k}(x_{2_j})^2\right]/k(k-1)$$

Expansion into the east

- Black duck
- Green-winged teal
- Ring-necked duck

Breeding ducks ‘Similar’ Provincial/State Surveys

- Some aerial, some not
  - Aerial, ground lines, ground plots
- California, Oregon, Washington, British Columbia,Nevada, Colorado, Wyoming, Nebraska, Minnesota, Wisconsin, Michigan, Northeastern US

Other breeding duck surveys

- Black duck – CWS helicopter plots
- Alaska sea ducks
- Eastern common eiders – breeding colonies
- Mottled duck – Florida and Texas

Midwinter duck surveys

- Aerial surveys
- Since 1950s but not consistent until mid70s
- State and FWS
- Lack of design, measures of precision
- Only known duck concentration areas
- Vulnerable to change

Special winter surveys

- Sea duck survey – Atlantic coast
  - Limited use
  - Visibility problems
- Area usage surveys – Refuges, etc.

Population Surveys

Canada Geese

Breeding ground surveys

- Arctic and Sub-Arctic Populations
  - Access
  - Expensive
- Resident Populations
- New standard
  - Growth of resident populations – mixing problems in winter – Mgmt. problems

Mid-winter surveys

- Bulk of populatons
- Need to differentiate population(s)
  - Works well with some populations
  - Mixing of populations can cause problems
- Some populations counted in migration – staging areas

Population Surveys – Light geese, Brant, & Others

- Mostly winter because nesting occurs in Arctic – difficult and expensive to survey
- Some on migration – staging
  - Greater snow goose – photographic
  - Mid-continent white-fronted goose

Understanding populations dynamics

Need for population vital rate measures other than abundance

Vital rates and other surveys

- Reproduction – young per female
  - Production surveys
- Survival & harvest rates
  - Banding-ringing
  - Marking – neck-collars
  - Telemetry studies
  - Harvest surveys

Production Surveys

Direct observation either during breeding season or of family groups post breeding

Production Surveys

- FWS July Production Survey
  - Subset of MAS
  - In July
  - US & Canadian Prairies and Prairie/Parklands
  - Some Boreal Forest areas
  - Limited Utility – no visibility correction
  - Need to revise – differentiate among species

Goose family units

- Plumage coloration/size
- Counts of family units

NORTH AMERICAN WATERFOWL BANDING PROGRAM

International effort – US & Canada

USGS-BBL and CWS – Banding Office

Uses of Banding Data

- Migration routes
  - Derivation and Distribution of the Harvest
  - Banding Reference Areas – population delineation
- Population vital statistics
  - Recovery rates x band reporting rates = harvest rates
  - Survival rates
  - Complex models

Preseason Duck Banding

- FWS & CWS Preseason Banding Programs
  - Western Canada
- Black Duck Joint Venture
  - CWS Eastern Canada
  - Provinces and States
- Flyway Banding Programs
  - All 4 Flyways support banding efforts

Winter banding

- Ducks – not management focus
- Geese – used to some extent
  - ‘new’ focus is banding on breeding areas
- Swans – used extensively

Goose Banding

- Some Canada goose populations
  - Assessment of Harvest
  - Rapidly growing populations – resident geese
- Overabundant white geese
  - Inaccessible – Arctic
  - Assessment of management actions
- Research work – especially species of concern

HARVEST ASSESSMENTS

Harvest Surveys

Hunter participation and success assessments

- HIP in US and Federal Permit in Canada
  - Mail Surveys
- Sampling frames – all migratory bird hunters
- Estimates of harvest
  - Temporally throughout season
  - Hunter participation/human dimension measures

Parts Collection Surveys

- Wings from ducks
- Tails from geese
- Species composition
- Age determination
- Production estimation

Synthesis

- Data from all the sources put together
- Vital rate estimation
- Understanding population dynamics
- Modeling populations
- Management actions