Deer Habitat Management

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- Collaborators
  - Thomas Hanley (presenter), PNW Research Station, Juneau
  - Dave Person, ADF&G Div. Wildlife Conservation, Ketchikan
  - Doug Larsen, ADF&G Div. Wildlife Conservation, Juneau
  - Michael McClellan, PNW Research Station, Juneau
  - Michael Goldstein, USFS Alaska Regional Office, Juneau
  - Joseph Doerr, White River NF, Glenwood Spring, CO

Important publications since the 1997 TLMP

- Parker, K.L., M.P. Gillingham, T.A. Hanley, and C.T. Robbins. 1999. Energy and protein balance of free-ranging black-tailed deer in a natural forest environment. Wildl. Monogr. 143:1-48.

- Person, D.K. 2001. Alexander Archipelago wolves: ecology and population viability in a disturbed, insular landscape. Ph.D. thesis. Univ. Alaska, Fairbanks.

- Doerr, J.G., E.J. DeGayner, and G. Ith. 2005. Winter habitat selection by Sitka black-tailed deer. J. Wildl. Manage. 69:322-331.

- Farmer, C.J., D.K. Person, and R.T. Boyer. 2006. Risk factors and mortality of black-tailed deer in a managed forest landscape. J. Wildl. Manage. (*in press*)

Important new tools since the 1997 TLMP

- **Habitat Evaluation**
  - Forage Resource Evaluation System for Habitat (FRESH-Deer)
    - Food-based system
  - Habitat Resource Utilization Functions: a meta-analysis
    - Behavior-based system
- **Population Management**
  - Deer-pellet DNA Census Technique

Topics to be covered in this presentation

1) Current Tongass NF deer habitat model

2) FRESH-Deer, a food-based habitat evaluation system

3) Habitat Resource Utilization Functions, a behavior-based habitat evaluation system

4) Tongass NF & ADF&G Joint Data for Hunters on POW

5) Deer-pellet DNA Census Technique

6) Young-growth Forest Management – new opportunities

7) Tongass-Wide Young-Growth Study (TWYGS)

Current Tongass NF deer habitat model

- A black-box, “all factor”-based model
- Developed from “professional judgment” of a “panel of experts”
- Appropriate at the scale of the entire Tongass NF or other very large planning areas
  - Where data are very coarse
- Not appropriate at the watershed level or, especially, the project level of planning/analysis
  - The model is too coarse for site-specific interest.

Forage Resource Evaluation System for Habitat (FRESH-Deer)

- A "snap-shot" analysis at one point in time

- A food-based system
  - Habitat data requirements:
    - Biomass of available forages (by species and part)
    - Nutritional quality of each forage (Digestible Energy and Digestible Protein)
  - User-specified animal metabolic requirements:
    - Metabolic energy (kJ/day), Digestible protein (g/day), Dry-matter intake (g/day) – depends on age, sex, season, and reproductive status

- Provides an estimate of "deer days per unit area" calculated from known nutritional relations – no expert opinion

- Identifies limiting factors (available biomass, DE, or DP) and most important forages (species & plant parts)

- Transforms summer datasets to snow-free winter estimates and includes a snow submodel to account for burial by snow

- Operates at two major scales: Stand (web-based) and Landscape (GIS-based)

FRESH-Deer (Continued)

- Advantages
  - Objectively based on sound nutritional science; no “black-box”
  - Can evaluate any habitat without need for use by deer – e.g., new habitats created by silviculture, or hypothetical future habitats
  - Can evaluate habitat for any user-specified metabolic requirements – e.g., age, sex, season, reproductive status
  - Identifies nutritional strengths and weaknesses of the habitat – e.g., limiting factors, forages

- Disadvantages
  - Data analysis system (requires original data), not a stand-alone model
  - “Deer days” is an index, not an actual estimate of “carrying capacity.”
  - Data requirements are great and labor-intensive (biomass & chemistry).
  - Tongass vegetation biomass and nutritional databases need much work.
  - Snow submodel needs field verification.
  - Does not account at all for animal behavior or other non-food factors

Habitat Resource Utilization Functions

- A behavior-based approach, entirely empirical
- Provides a season-specific estimate; also age- and sex-based if sufficient data
- Probability of Use ($\hat{Y}$) = $a + b_1X_1 + b_2X_2 + b_3X_3 + \ldots b_nX_n$
- Meta-analysis of 5 major studies spanning 2 decades and most of SE Alaska
  - Schoen-Kirchhoff on Admiralty Island in early 1980s
  - Yeo-Peek on POW in mid to late 1980s
  - Doerr-DeGayner-Ith on Mitkoff in late 1990s
  - Farmer-Person-Boyer on Heceta in late 1990s
  - Person on POW in 1999-2004
- Applicable at the landscape level of analysis (e.g., watershed) – requires GIS data
- Can be linked directly to the FRESH-Deer GIS-based, landscape level application, providing a behavior-adjusted estimate of food resource values

Habitat Resource Utilization Functions (Cont.)

- Advantages
  - Account for animal behavior without great complexity or assumptions
  - Incorporate the full landscape (topography, vegetation, roads, etc.)
  - Data-based; no “expert opinion”
  - Meta-analysis of several studies is much more likely to be predictive than would be the case for only one study.

- Disadvantages
  - Strictly statistical correlations (“black box”) with causal relations only inferred
  - Descriptive, not predictive – especially so for individual studies – thus, very time, place, and population-density specific
  - Habitat values are “probability of use,” not any sort of animal units.
  - Can only be applied to habitats that have been studied extensively for patterns of use by deer
    - ➢ Cannot be applied to novel habitats or novel combinations of habitats
  - NOTE, however, the meta-analysis of 5 studies widespread in both space and time helps to minimize many of these disadvantages.

Tongass NF & ADF&G Joint Data for Unit 2 Deer (Prince of Wales Island)

- A collaborative effort between the Tongass NF and ADF&G Division of Wildlife Conservation

- Goal is to obtain detailed data on hunter effort, success, and locations on Prince of Wales Island
  - Breakdown by community of residence and location of hunting
  - Focus is on both subsistence and sport hunting
  - Where are deer being taken? How many deer and of what sex and age are being taken? How well is hunter demand being met?

- Data are from survey questionnaires.

- Decisions include input from a Deer Management Advisory Board.

Deer-pellet DNA Census Technique

- Cooperative study between the Tongass NF, USFS Regional Office (Wildlife Information Systems), ADF&G, and University of Alaska Fairbanks

- Goal: To test the applicability of DNA extracted from deer fecal pellets for "mark-recapture" census technique for Southeast Alaska landscapes

- If successful, this technique will yield the first estimates of actual deer densities (number per unit area) ever obtained in SE Alaska.

- Secondary objective: To develop efficient sampling protocols for subsequent implementation of the technique

- Study area is several watersheds on Prince of Wales Island.

- Although the technique likely will be too expensive (field labor and lab) for routine application, it could be used to validate/calibrate less expensive index techniques (e.g., fecal density transects) that can be used routinely.

Young-growth Forest Management – new opportunities

- Thousands of acres of young-growth forest are approaching the time where they can be harvested commercially – especially given the changes occurring within the forest industry today.

- Opportunities exist for improving even-aged, young-growth stands with timber harvest:
  - Judicious placement (landscape pattern) of limited clearcuts
  - Partial cutting with various patterns of retention
  - Commercial thinning – various forms, spacing, timing, etc.
  - Combinations of the above, plus precommercial thinning
  - Wildlife Conservation Reserves (e.g., beach fringe, riparian buffers) offer some of the highest potentials, and any cutting there must be done to benefit wildlife habitat foremost.

- Precommercial thinning
  - Thousands of acres need treatment.
  - Recent observations are encouraging, but knowledge is needed.
  - Various options – age, spacing, pruning, multiple entries, planting alder, etc.
  - Residual slash is a concern.

- Data are very few and sorely needed. Cause-and-effect relations and quantitative guidelines are even more rare. Study is needed.

Tongass-Wide Young-Growth Study (TWYGS)

- Large-scale, statistically sound (randomized, replicated [N=20]), Tongass-wide, framework for adaptive-management study

- Conducted by the Tongass NF in collaboration with PNW Research Station

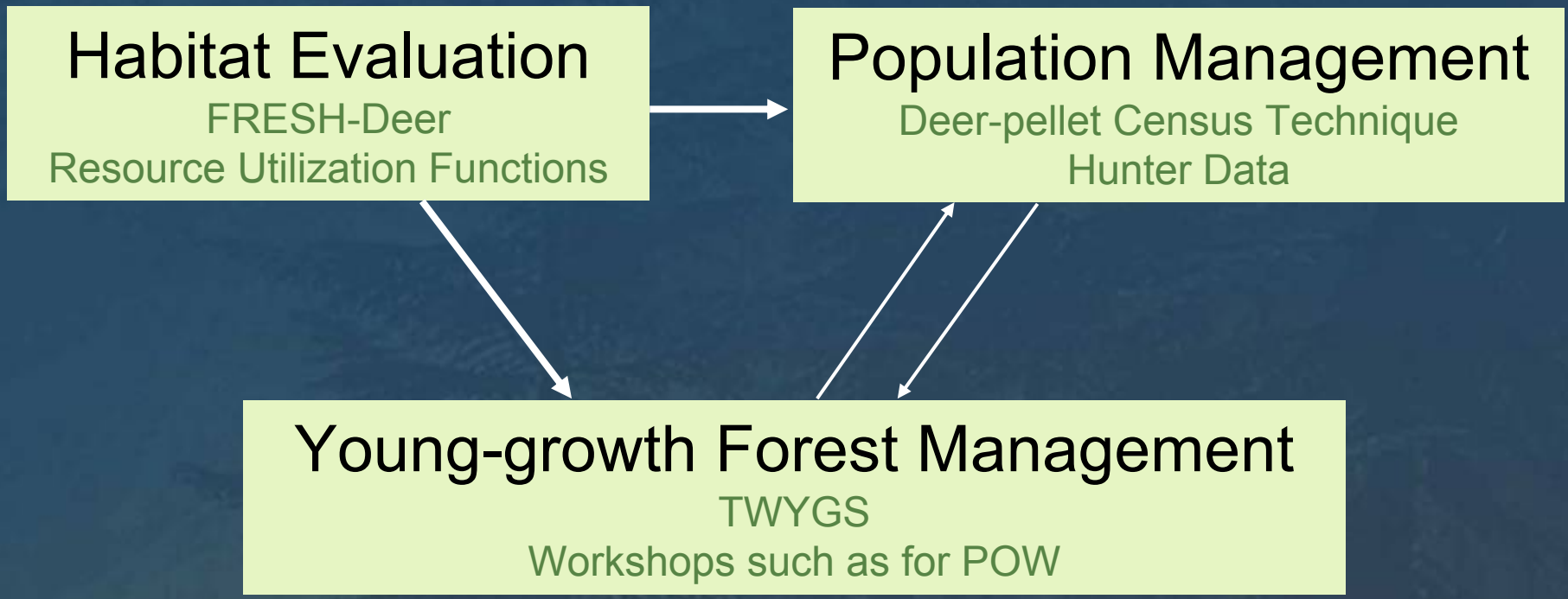
- Will provide strong data on results of treatments and potential applications for management

- Current studies:
  - Module 1 - Mixed red alder/conifer stands (planted w/ alder) – FY03
  - Module 2 - Precommercial thinning – FY03
  - Module 3 - Precommercial thinning w/ Pruning – FY03
  - Module 4 – Older PCT stands – traditional falling with slash treatment & girdling – FY05(?)
  - Module 5 - Riparian Precommercial Thinning – FY07

- These will be the most intensive and extensive studies of young-growth silviculture ever conducted in SE Alaska.

- Approach is entirely empirical (no theory of cause-and-effect), and results will require many years of observation.

Opportunities for the Future



Conservation Strategy Review Consideration

- Description: FRESH-Deer implementation on the Tongass NF
- Implementation
  - Skill Levels Required: Understory vegetation sampling and data management; knowledge of existing Tongass vegetation data; knowledge of Tongass GIS system and data; skill levels "moderate" in all
  - Level of Rigor Required: High rigor for original (new) data; substantially less rigor for application of already existing data
  - Timeframe: Several years of ongoing, low-level commitment
- Product/Output: Databases sufficient for application of FRESH-Deer throughout the Tongass without need to collect original data for each use
- Use of Product/Output: Routine project-level planning; evaluation of silviculture results; eventual revamping of Tongass-wide deer model (from black box to fully apparent and data-based)

Conservation Strategy Review Consideration

- Description: Linking the Habitat Resource Utilization Function (HRUF) model with the FRESH-Deer system
- Implementation
  - Skill Levels Required: Knowledge of Tongass GIS system and ability to learn both FRESH-Deer and HRUF model; skill levels "high"
  - Level of Rigor Required: High
  - Timeframe: Within one year of whenever both FRESH-Deer and the HRUF meta-analysis are applicable for implementation independently
- Product/Output: A very broad-based deer habitat analytical tool that incorporates both food resources and deer behavior; both can be predicted independently as well as in combination, and results can be compared
- Use of Product/Output: Routine project-level planning; evaluation of silviculture results; eventual revamping of Tongass-wide deer model (from black box to fully apparent and data-based)

Conservation Strategy Review Consideration

- Description: Continuation of study of Deer Pellet DNA Census Technique with aim toward implementation
- Implementation
  - Skill Levels Required: Knowledge of statistical sampling theory and application; skill level "moderate"
  - Level of Rigor Required: High
  - Timeframe: Depends on results of the study and its conclusions, but once implemented, it could provide the basis for a long-term and continuing monitoring system
- Product/Output: Deer population monitoring system
- Use of Product/Output: Routine planning for harvest/herd management; monitoring and evaluation of landscape-level responses to forest management