PhD Literature Review Notes

Developing and Enhancing Integrated Population Models and Decision-Support Tools for White-tailed Deer Management

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# **JUSTIFICATION OF RESEARCH / GAPS IN RESEARCH**

## **MANAGEMENT NEEDS**

## **STAKEHOLDER EXPECTATIONS**

## **LITERATURE GAPS IN QUANTITATIVE ECOLOGY**

## **KNOWLEDGE AND APPLICATION GAPS IN ALABAMA**

## **BROADER SCIENTIFIC OR PRACTICAL IMPACT**

**GENERAL BIOLOGY AND ECOLOGY OF WHITE-TAILED DEER**

## **TAXONOMY AND GEOGRAPHIC RANGE**

SPECIES: *ODOCOILEUS VIRGINIANUS*

SUBSPECIES AND REGIONAL VARIATIONS

HISTORICAL AND CURRENT DISTRIBUTION ACROSS NORTH AMERICA, WITH EMPHASIS ON SOUTHEASTERN U.S. AND ALABAMA

## **MORPHOLOGY AND PHYSIOLOGY**

BODY SIZE, ANTLER DEVELOPMENT, AND SEXUAL DIMORPHISM

PHYSIOLOGICAL ADAPTATIONS TO CLIMATE, HABITAT, AND SEASONAL VARIATION

REPRODUCTIVE PHYSIOLOGY (ESTRUS CYCLE, GESTATION, PARTURITION)

## **REPRODUCTION AND LIFE HISTORY**

BREEDING SEASON (TIMING, FREQUENCY)

LITTER SIZE, BIRTH TIMING, AND FAWN SURVIVAL

AGE-SPECIFIC FECUNDITY AND REPRODUCTIVE EFFORT

LONGEVITY AND MORTALITY CAUSES

## **BEHAVIOR AND SOCIAL STRUCTURE**

TERRITORIALITY AND HOME RANGE SIZE

DISPERSAL AND MOVEMENT PATTERNS (JUVENILE DISPERSAL, SEASONAL MIGRATION)

SOCIAL HIERARCHY AND GROUP STRUCTURE (DOE GROUPS, BACHELOR GROUPS)

ACTIVITY PATTERNS (DIURNAL/NOCTURNAL, SEASONAL SHIFTS)

## **DIET AND FORAGING ECOLOGY**

SEASONAL DIET COMPOSITION (BROWSE, MAST, FORBS, CROPS)

NUTRITIONAL REQUIREMENTS BY SEX, AGE, AND SEASON

ROLE IN FOREST SUCCESSION AND VEGETATION DYNAMICS

## **PREDATION AND DISEASE ECOLOGY**

PREDATION RISKS (NATURAL PREDATORS, HUMAN HARVEST)

PARASITES AND DISEASE CONCERNS (E.G., EHD, CWD)

IMPACTS OF DENSITY ON HEALTH AND DISEASE SPREAD

## **POPULATION DYNAMICS**

RECRUITMENT, SURVIVAL, AND MORTALITY RATES

AGE STRUCTURE AND SEX RATIOS

DENSITY DEPENDENCE AND CARRYING CAPACITY

DEMOGRAPHIC STOCHASTICITY AND ENVIRONMENTAL DRIVERS

## **IMPORTANCE OF WHITE-TAILED DEER IN ALABAMA**

ECOLOGICAL SIGNIFICANCE AS HERBIVORES AND PREY

ECONOMIC IMPACT (E.G., ~$1 BILLION FROM HUNTING)

SOCIAL AND RECREATIONAL IMPORTANCE (HUNTING, WILDLIFE VIEWING)

ROLE IN VEHICLE COLLISIONS AND HUMAN-WILDLIFE CONFLICT

## **HISTORICAL AND CURRENT MANAGEMENT PRACTICES**

HISTORY OF DEER POPULATION RECOVERY AND MANAGEMENT IN ALABAMA

HARVEST REGULATIONS (SEASON LENGTH, BAG LIMITS, ANTLER RESTRICTIONS)

DEER MANAGEMENT ASSISTANCE PROGRAM (DMAP)

MONITORING EFFORTS (GAME CHECK, CHECK STATIONS, AERIAL SURVEYS)

## **STAKEHOLDER EXPECTATIONS AND MANAGEMENT OBJECTIVES**

STAKEHOLDER GROUPS (HUNTERS, LANDOWNERS, CONSERVATIONISTS)

DESIRED POPULATION OBJECTIVES (QUALITY VS. QUANTITY)

CONFLICT MITIGATION (CROP DAMAGE, URBAN DEER)

INTEGRATION OF BIOLOGICAL DATA INTO MANAGEMENT DECISIONS

# **DATA SOURCES AND QUALITY FOR WTD MONITORING**

## **TRADITIONAL DATA SOURCES**

GAME CHECK DATA

HUNTER HARVEST SURVEYS

CHECK STATIONS AND DMAP

## **SUPPLEMENTAL AND EMERGING DATA SOURCES**

CITIZEN SCIENCE AND PUBLIC OBSERVATIONS

VEHICLE COLLISIONS AND ROADKILL

DISEASE MORTALITY REPORTS

CAMERA TRAPS

DRONES AND THERMAL SURVEYS

SHORT-TERM TELEMETRY STUDIES

## **DATA INTEGRATION CHALLENGES AND OPPORTUNITIES**

SPATIAL AND TEMPORAL RESOLUTION

DATA BIAS AND PRECISION

COST AND LOGISTICAL CONSTRAINTS

# **POPULATION MODELING APPROACHES**

## **DETERMINISTIC ACCOUNTING MODELS**

## **STOCHASTIC MATRIX MODELS**

## **N-MIXTURE AND HIERARCHICAL MODELS**

## **BAYESIAN APPROACHES TO INTEGRATION AND INFERENCE**

## **AGENT-BASED AND INDIVIDUAL-BASED MODELS**

# **PARAMETERIZATION AND PROCESSING**

## **PARAMETER IDENTIFICATION AND SELECTION**

## **DEMOGRAPHIC PARAMETERS**

SURVIVAL

FECUNDITY

AGE STRUCTURE

## **INITIAL CONDITIONS AND STARTING POPULATIONS**

## **ENVIRONMENTAL COVARIATES AND SCENARIO DRIVERS**

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## **SPATIAL DATA CONSIDERATIONS**

## **TEMPORAL ALIGNMENT OF DAATASETS**

## **AGGREGATION VS INDIVIDUAL DATA FORMATS**

## **USING SUPPLEMENTAL SOURCES TO INFORM PARAMETER ESTIMATES**

## **PREPARING INPUT DATA FOR DIFFERENT MODEL PLATFORMS**

MATRIX

AGENT-BASED

BAYESIAN

# **INTEGRATED MODEL EVALUATION AND VALIDATION**

## **DOCUMENTATION OF MODEL ASSUMPTIONS AND LIMITATIONS**

## **RETROPREDICTIVE PERFORMANCE AND BACKCATING**

## **UNCERTAINTY QUANTIFICATION**

## **SENSITIVITY ANALYSIS OF INPUT PARAMETERS**

## **VALIDATION USING INDEPENDENT OR SPLIT-SAMPLE TECHNIQUES**

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## **STAKEHOLDER REVIEW AND PRACTICAL VALIDATION**

# **MANAGEMENT IMPLICATIONS AND**

## **HARVEST DECISION SUPPORT**

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## **MODELING TRADEOFFS AND SCENARIO PLANNING**

## **ACCESSIBILITY TO STAKEHOLDERS**

## **DECISION-MAKING TOOL DEVELOPMENT**

# **DATA, SOFTWARE, AND TOOLS**

## **SOURCES**

## **GIS AND SPATIAL DATA TOOLS**

## **NETLOGO**

## **R**

## **DECISION SUPPORT TOOLS IN PRACTICE**

## **RELEVANT WORKSHOPS AND TRAINING RESOURCES**

## **DECISION-MAKING TOOL DEVELOPMENT**

# **VISUALIZATION AND DISSEMINATION**

## **FIGURES AND TABLES**

## **DASHBOARDS AND PLATFORMS**

## **WORDSMITHING**

## **PRESENTATIONS**

* agent-based modeling breakdown and visualization [(Liberati 2023)](https://sciwheel.com/work/citation?ids=17287719&pre=&suf=&sa=0&dbf=0)