APPENDIX C: BASELINE INVENTORIES, STUDIES AND RESEARCH NEEDS

The following studies are expected to provide answers to various aspects of management that remain partially unresolved. Research and other studies will be integrated within an ecosystem management framework to the extent possible, rather than conducted for individual program areas. However, items are. listed under the various program areas for simplicity. Results of these studies will improve understanding of physical and biological processes in complex natural systems.

PHYSICAL ENVIRONMENT

Air Quality

1. What is the optimum network of weather stations for smoke management?

2. What are the best locations to acquire baseline air quality data for visibility monitoring?

Watershed Management

1. Develop valid, representative sediment yield rates for various combinations of geologic / landform *I* soil types, management disturbances (such as road segments and stream crossings), and silvicultural treatments to be used in cumulative watershed effects analyses.

2. Develop meaningful links between geomorphic / hydrologic and fisheries habitat stream classification systems to improve understanding of cause and effect relationships between physical watershed processes and biologic response.

BIOLOGICAL ENVIRONMENT

Fisheries and Riparian Species

1. Reliable life history data on TES and MIS fish and amphibians, including spawning and rearing habitat and time frames, population trends and viability. Species include Spring chinook salmon, summer steelhead, cutthroat trout, steelhead trout, tailed frog, red-legged frog, Olympic salamander, and western pond turtle.

2. Data on aquatic / land interactions within riparian ecosystems:

   - role and historic levels of large woody debris in riparian zones;
   - ecological functions of riparian vegetation;
   - habitat components for all dependent species;
   - spatial changes in riparian zones over time.

Wildlife Management

Endangered:

(a) Peregrine Falcon – identify primary feeding areas, measure eggshell thickness, monitor chemicals in prey species.

(b) Bald Eagle – identify wintering areas and primary feeding areas in occupied nest territories; determine essential prey species during breeding season.

2. **Threatened:**

(a) Northern Spotted Owl (NSO) – determine effectiveness of the Adaptive Management Strategy as it applies to the NSO; refer to Appendix Tables R-1 and R-2 which present hypotheses and research questions that need to be addressed during the first decade of Plan implementation; the Forest will cooperate closely with the Redwood Sciences Lab, Arcata.

General research questions include: (1) Are HCAs occupied by at least 20 pair of reproductively successful spotted owls? (2) Is the Willow Creek Demographic Study Area representative of the Klamath province in terms of NSO demographics? (3) What are population trends of NSO in the Forest matrix? (4) Are the assumptions and expected outcomes of the ISC correct?

(b) Marbled Murrelet – What is the distribution of murrelet on the Forest, and what habitats are essential for their recovery?

3. **Candidate:** Red-legged frog, Del Norte salamander, California wolverine, northwestern pond turtle, white-footed vole – baseline inventories to determine occurrence and distribution on Forest, and essential habitat needs.

4. **Sensitive:**

(a) Willow flycatcher, great grey owl – determine occurrence on Forest, distribution of breeding territories, and essential habitat requirements.

(b) Northern goshawk – baseline inventories to determine distribution on Forest and essential habitat needs; validate assumption that designated habitat is occupied with reproductively successful pairs.

(c) American marten, Pacific fisher – Validate assumptions that designated habitat is occupied and supports reproductively successful pairs. Validate California Region Draft Habitat Capability Models: Do the models accurately describe suitable marten and fisher habitat in the Klamath Province? What does occupied habitat look like, compared to treated habitat? Are areas designated in the Plan supporting viable sub-populations? Are vacant habitat areas being recolonized during the planning period? Does the Humboldt marten occur in redwood or coastal forest types on the Six Rivers?

Priority research topics from the Western Furbearer Assessment Team, 5/90:

(1) *Current status of marten and fisher populations in the western US:* What are current and historic distribution and abundance of marten and fisher on the Six Rivers and in the Klamath Province? What are trends in population sizes?

(2) *Species habitat associations:* How do habitat use patterns and home range size vary as a function of (a) mix of forested/non-forested habitats; (b) successional stages due to natural and human disturbances; (c) forest fragmentation; (d) road class, density and use? What silvicultural practices can best maintain or enhance fisher and marten habitat?

(3) *Habitat needs for population viability:* How should viability be defined for eachspecies? How much and what kinds of habitat are needed for viability, and how should they be distributed over the landscape? What arethe effects of predation and disease on fisher and marten, and how do they vary in response to habitat management?

5. **Diversity and Modeling Issues:**

(1) Need a current and regularly updated inventory of late- successional forest habitat, based on wildlife needs rather than timber inventory criteria. Inventory factors should include elevation ranges, vegetation groups, habitat site quality and geographic variations.

(2) Habitat fragmentation and connectivity – evaluate the amount, size, shape and spatial arrangement of habitat patches. Do riparian reserves and other designated movement corridors maintain connectivity between late-successional reserves?

(3) Evaluation of habitat use by assemblage species with respect to: snags, down woody material, hardwoods, riparian areas, and rock outcrops and talus.

(4) Validation of interim Habitat Capability Models to refine parameters that better reflect local conditions. What does occupied habitat look like, compared to treated habitat?

SOCIO-ECONOMIC ENVIRONMENT

Community Health

1. Evaluate potential effects on timber-dependent communities by decreases in available timber volumes.

2. Evaluate potential diversification of socio-economic conditions and opportunities in the areas of Humboldt, Del Norte, and Trinity Counties as the timber supply diminishes.

RESOURCE MANAGEMENT PROGRAMS

Fire and Fuels Management

1. Evaluate effects of decay rates on all fuel types on the Forest, including natural and harvest residues (both charred and uncharred).

2. Evaluate effects of other factors on fuel types on the Forest, including elevation, aspect, and type of vegetation.

3. Evaluate suitability and desirability of charred woody residues for wildlife uses (such as pileated woodpecker).

4. Determine levels of fuels inventory that are adequate for fire management planning.

5. What is the natural (background) fire regime on the Forest?

6. How can spatial management of fire and fuels be incorporated in ecosystem management? How can fuels treatment and prescribed fire be used to mimic natural processes and improve forest health?

7. How has the exclusion of fire on the Six Rivers and surrounding areas affected the composition and structure of ecosystems?

8. What short-term and long-term effects do fuel treatments have on wildlife and their habitats? On botanical areas?

9. What are the fire hazard implications of different silvicultural practices, such as post-harvest planting densities? Would lower densities reduce or eliminate the need for precommercial thinnings?

Heritage Resources

1. Forest-wide thematic study of Native American spiritual values, in order to enhance management and protection of NACUAs.

2. Cultural resources inventories along river corridors and in Wilderness Areas in order to protect cultural sites and values from recreational uses.

3. Forest-wide thematic study of historic ditches and trails, in order to develop management strategies to protect historic values and allow public enjoyment where appropriate.

Range Management

1. What constitutes satisfactory ecological condition on wet meadow and riparian areas?

Vegetation Management

1. Establish permanent plots to track vegetation changes over time in both managed and unmanaged stands.

2. Evaluate reproduction and growth of conifers, hardwoods and shrubs within stands. regenerated with various levels of green tree retention; include determination of timber yields.

3. Develop and evaluate alternative site preparation techniques to maintain snags, logs and live hardwoods and conifers in regenerated stands on slopes steeper than 40 percent.

4. Evaluate differential radial growth response of conifers thinned to very wide spacings.

5. Evaluate reproduction and growth of conifer seedlings and other vegetation within 1/8- to 1/2-acre openings created in 70-150 year-old Pacific Douglas-fir, Douglas-fir / tanoak / madrone, and white fir stands.

6. Develop methods of creating decadence in Douglas-fir and true fir stands. Measure rates of decadence progression after wounding and death.

7. Evaluate pattern and rate of vegetation change within Pacific Douglas-fir, Douglas-fir / tanoak / madrone, white fir and red fir stands older than 200 years.

8. Evaluate vegetation changes in mature stands with respect to proximity to edge.

9. Determine vegetation response, as measured by overstory radial growth, mortality, crown cover and understory development, to thinning in 150-250 year-old Pacific Douglas-fir, Douglas-fir / tanoak / madrone, white fir and red fir stands.

10. Evaluate effects of precommercial thinning in young plantations in terms of creating suitable Northern Spotted Owl habitat.

11. Develop predictive models of fire risk for landscape level management strategies under various fuel loading assumptions.

12. Evaluate growth of hardwoods following precommercial thinning of sprout clumps in mixed conifer/hardwood plantations.

13. Evaluate maintenance of black oak *(Quercus Kelloggii)* within Pacific Douglas-fir stands. as well as growth and mast production in relation to managed densities.