

**U.S. DEPARTMENT OF ENERGY
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT**

**PRESENTATION TO
THE NUCLEAR WASTE TECHNICAL REVIEW BOARD**

SUBJECT: TERRESTRIAL ECOSYSTEMS

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OBJECTIVES OF TERRESTRIAL ECOSYSTEMS STUDIES

- **MONITOR EFFECTS OF SITE CHARACTERIZATION ACTIVITIES ON BIOLOGICAL RESOURCES**
- **PROTECT THREATENED AND ENDANGERED SPECIES**
- **SUPPORT RADIOLOGICAL MONITORING PROGRAM**
- **DEVELOP MITIGATION/RECLAMATION STRATEGIES**
- **PROVIDE BIOLOGICAL EXPERTISE FOR SPECIAL ISSUES (e.g. ASH MEADOWS)**

DESIGN CONSIDERATIONS

- **OBJECTIVES**
- **POSSIBLE CAUSES**
- **POSSIBLE ACTIVITIES**
- **POSSIBLE EFFECTS**
- **OTHER CONSIDERATIONS**
- **POSSIBLE RESOURCES AFFECTED**
- **EXISTING DATA**

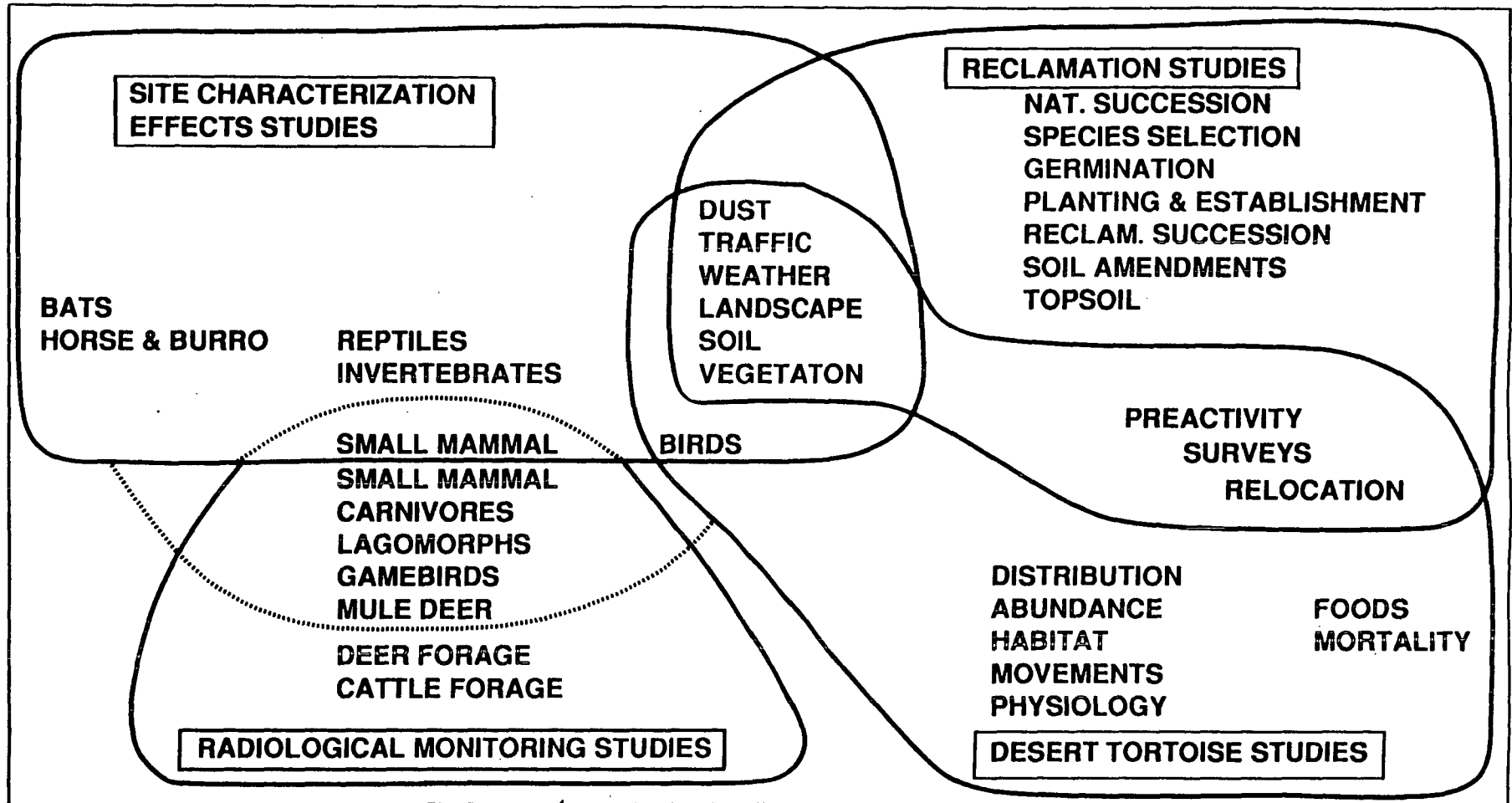
PROGRAM INTEGRATION

	SITE CHARACTERIZATION EFFECTS STUDIES	DESERT TORTOISE	RECLAMATION	RADIOLOGICAL
OBJECTIVES	DETERMINE EFFECTS	DETERMINE EFFECTS	MITIGATE EFFECTS	DETERMINE EFFECTS
SOURCE	CONSTRUCTION	CONSTRUCTION	CONSTRUCTION	RADIONUCLIDES
SCALE	MULTIPLE LOCATIONS SHORT-TERM SMALL	MULTIPLE LOCATIONS SHORT-TERM SMALL	MULTIPLE LOCATIONS SHORT-TERM SMALL	LARGE SCALE LONG-TERM
RESPONSE	SMALL SCALE	MODERATE SCALE	SMALL SCALE	LARGE SCALE
RESOURCE SELECTED	LIMITED MOVEMENT IMPORTANT IN SYSTEM HABITAT	DESERT TORTOISE HABITAT	SOIL VEGETATION LANDSCAPE	ACCUMULATORS DISPERSERS

CHARACTERISTICS USED TO SELECT BIOLOGICAL ATTRIBUTES

- **SIGNIFICANT SYSTEM COMPONENTS**
- **MOST LIKELY IMPACTED COMPONENTS**
- **RAPIDLY/EASILY ASSESSED**
- **SCALE OF IMPACT vs. BIOTA RESPONSE SCALE**
- **THREATENED AND ENDANGERED SPECIES**
- **RADIOLOGICALLY IMPORTANT SPECIES**
- **ECOSYSTEM vs. COMMUNITY/POPULATION FOCUS**

INTEGRATION OF STUDY PROGRAMS



GEOGRAPHIC INFORMATION SYSTEM (GIS)
 SOIL SURVEY INFORMATION
 NATIVE AMERICAN INFORMATION
 METEOROLOGY
 AIR QUALITY
 WATER INFILTRATION

ACTIVITY SITING PROCESS
 LAND ACCESS & APPROVAL PROCESS

EXPERIMENTAL DESIGN

SITE CHARACTERIZATION EFFECTS STUDIES

- **TREATMENT vs. CONTROL COMPARISON**

- TREATMENT
- PAIRED PLOTS
- BLOCK BY VEGETATION ASSOCIATION
- PRE/POST SAMPLES
- TREND COMPARISONS

- **SIMILAR SAMPLE LOCATIONS FOR STUDIES**

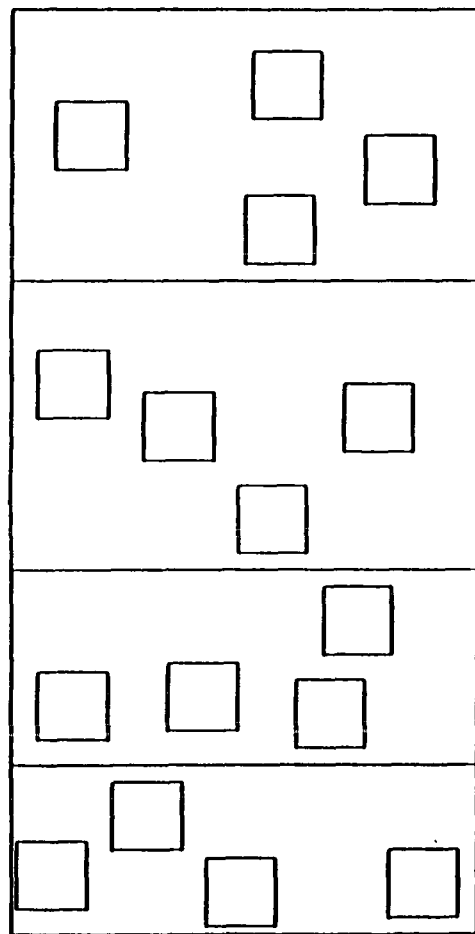
- **FEATURES MONITORED**

- | | |
|-------------------|-----------------|
| - LANDSCAPE | - VEGETATION |
| - SOIL | - SMALL MAMMALS |
| - WEATHER | - NONGAME BIRDS |
| - TRAFFIC | - INVERTEBRATES |
| - DUST DEPOSITION | - REPTILES |

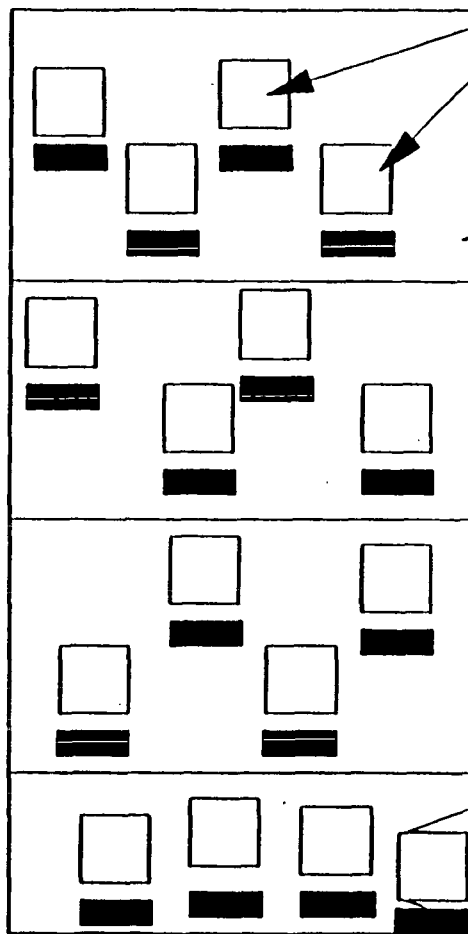
HYPOTHESES FOR SITE CHARACTERIZATION EFFECTS STUDIES

- **SPECIES AND BIOTIC COMMUNITY MEASURES ARE NOT DIFFERENT AMONG VEGETATION ASSOCIATIONS**
- **SPECIES AND BIOTIC COMMUNITY MEASURES ON TREATED SITES (ADJACENT TO SITE CHARACTERIZATION) ARE NOT DIFFERENT FROM MEASURES AT CONTROL SITES (NOT ADJACENT TO SITE CHARACTERIZATION)**
- **SPECIES AND BIOTIC COMMUNITY MEASURES AT TREATMENT AND CONTROL SITES RESPOND IN EQUAL PROPORTIONS OVER TIME TO ENVIRONMENTAL FACTORS OTHER THAN SITE CHARACTERIZATION ACTIVITIES**
- **SPECIES AND BIOTIC COMMUNITY MEASURES AT TREATMENT SITES ARE NOT DIFFERENT AMONG DISTANCES FROM SITE CHARACTERIZATION ACTIVITIES**

SAMPLE LOCATION DESIGN PROTOCOL



CONTROL



TREATMENT

 **SITE CHARACTERIZATION ACTIVITY**

ESP_s

COLEOGYNE

LYCIUM-GRAYIA

LARREA-LYCIUM-GRAYIA

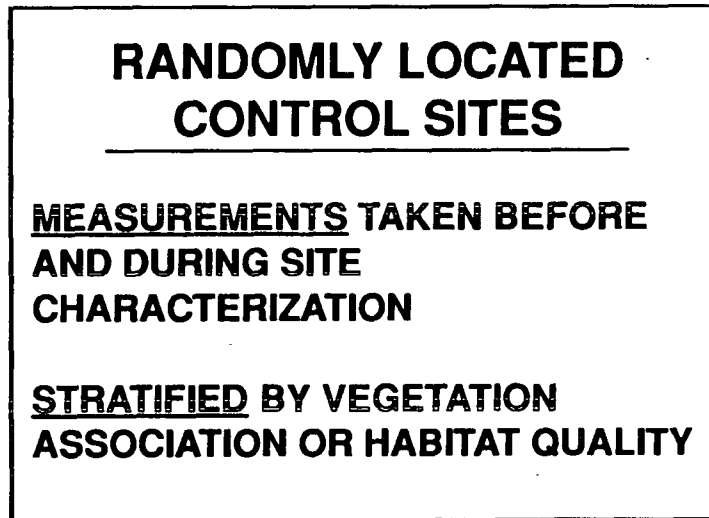
LARREA-AMBROSIA

DISTANCE STRATA

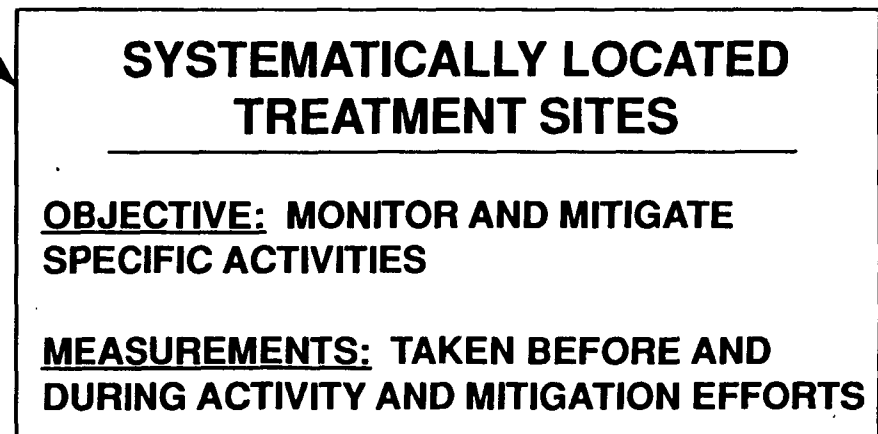
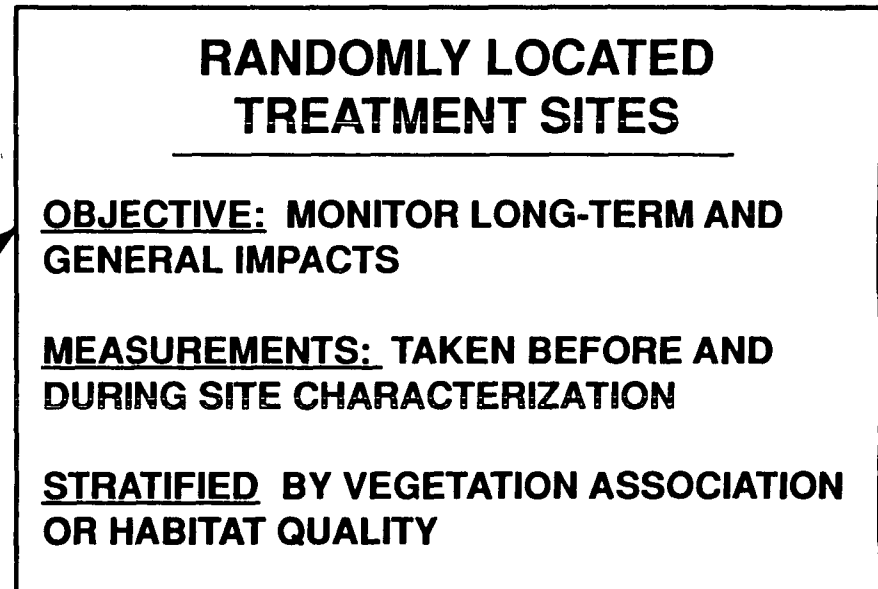
HYPOTHESES FOR DESERT TORTOISE STUDY

- **MEASURES OF DESERT TORTOISE DO NOT DIFFER AMONG VEGETATION ASSOCIATIONS**
- **MEASURES OF DESERT TORTOISE AND HABITAT DO NOT DIFFER AMONG TREATED AND CONTROL LOCATIONS**
- **FUNCTIONAL ATTRIBUTES OF DESERT TORTOISE ARE NOT DIFFERENT ON DISTURBED VERSUS UNDISTURBED AREAS**

UNAFFECTED AREAS



SITE CHARACTERIZATION STUDY AREA



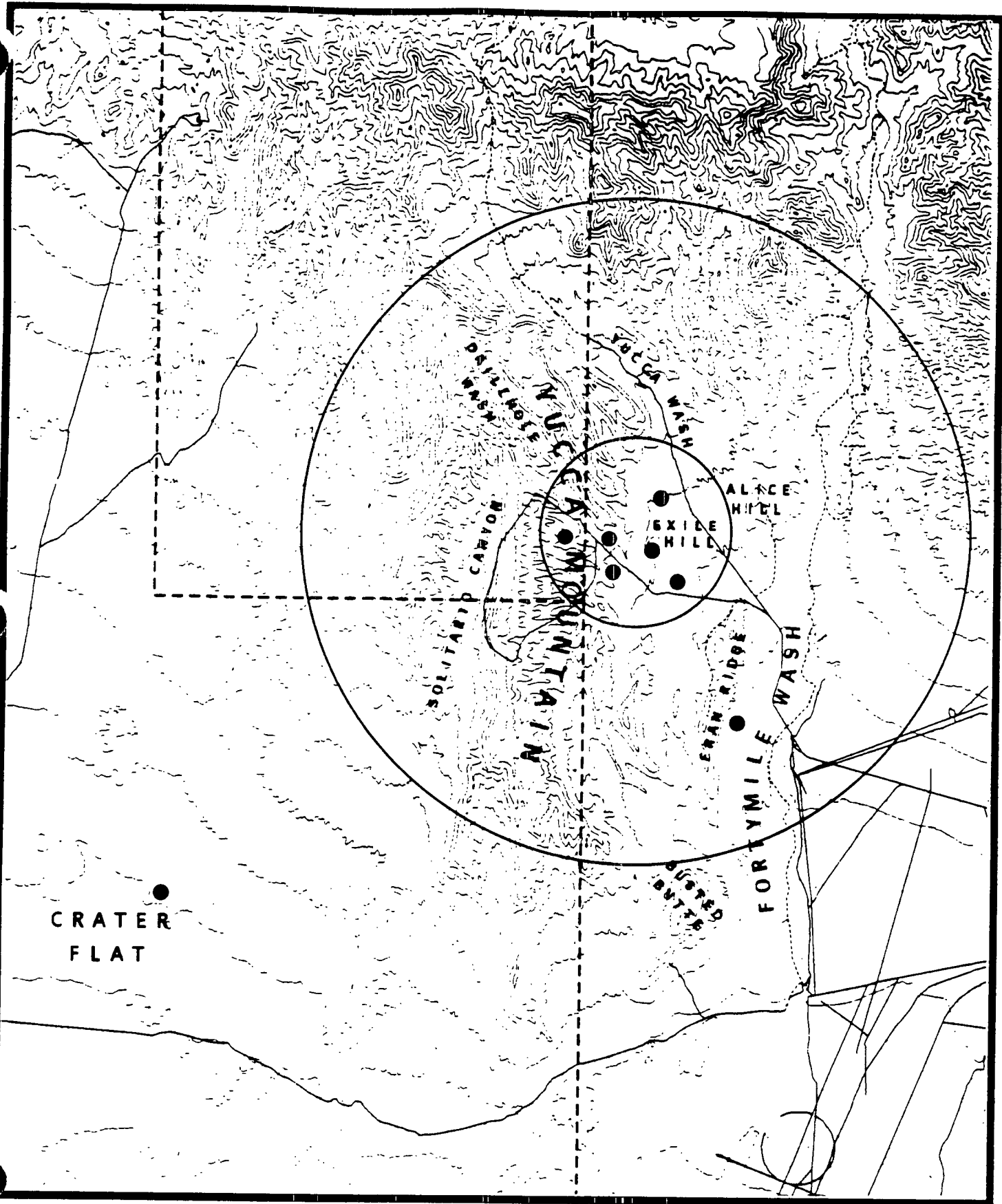
EXPERIMENTAL DESIGN RADIOLOGICAL MONITORING PROGRAM

- **THREE GENERAL RADIONUCLIDE SOURCES OF INTEREST**
 - **ESF AREA & ACTIVITIES**
 - **NTS ACTIVITY**
 - **ENVIRONMENTAL BACKGROUND**
- **ANNUAL SAMPLES TAKEN FROM PERMANENT LOCATIONS RADIATING FROM ESF AREA**
- **DETERMINE ASSOCIATED SPECIES ABUNDANCE/
DISTRIBUTION FOR FUTURE SAMPLING AND
PATHWAY ANALYSIS**

HYPOTHESES FOR RADIOLOGICAL MONITORING PROGRAM

- **RADIONUCLIDE LEVELS WILL BE SIMILAR FOR BIOLOGICAL SAMPLES COLLECTED FROM ALL AREAS**
- **RADIONUCLIDE LEVELS WILL BE SIMILAR FOR BIOLOGICAL SAMPLES OVER TIME**

RADIOLOGICAL MONITORING SAMPLE LOCATIONS



EXPERIMENTAL DESIGN RECLAMATION STUDIES

- **UNIVARIATE DESIGNS**

- ENVIRONMENTAL CONDITIONS MONITORED

- **STEP-WISE STUDY INTEGRATION**

- 1. WHAT ARE CONDITIONS OF AREA SOIL ANALYSIS

- 2. WHAT SPECIES ARE BEST ADAPTED

- 3. WHAT IS NEEDED TO ESTABLISH SPECIES

- 4. WHAT IS NEEDED TO ENSURE CONTINUED SURVIVAL

HYPOTHESES FOR RECLAMATION STUDIES

- **ALL SPECIES TESTED HAVE SIMILAR GERMINATION, SURVIVAL, AND GROWTH CHARACTERISTICS**
- **ALL SOIL AND CULTURAL TREATMENTS HAVE SIMILAR IMPACTS ON SPECIES ESTABLISHMENT, SURVIVAL, AND GROWTH**
- **THERE IS NO DIFFERENCE IN ENVIRONMENTAL ATTRIBUTES BETWEEN DISTURBED AND UNDISTURBED SITES**
- **THERE IS NO DIFFERENCE AMONG RECLAIMED AND UNRECLAIMED DISTURBED SITES AND UNDISTURBED SITES**

TECHNICAL QUESTIONS

- 1. WHAT ARE THE EFFECTS OF SITE CHARACTERIZATION ACTIVITIES TO BIOLOGICAL RESOURCES?**
- 2. WHAT ARE THE POTENTIAL PATHWAYS OF RADIATION TO MAN AND THE ENVIRONMENT?**
- 3. WHAT ARE THE RECLAMATION TECHNIQUES NEEDED TO RECLAIM HABITATS DISTURBED BY SITE CHARACTERIZATION ACTIVITIES?**

TECHNICAL QUESTION 1: WHAT ARE THE EFFECTS OF SITE CHARACTERIZATION ACTIVITIES TO BIOLOGICAL RESOURCES?

STATUS

● PREACTIVITY SURVEYS

- CONDUCT AS REQUIRED

● SITE CHARACTERIZATION EFFECTS STUDIES

- REVISE EFAP TO REFLECT CURRENT DESIGN
- INITIATE MICROSITE METEOROLOGICAL/DISTURBANCE MONITORING
- EXPAND AND CONTINUE VEGETATION STUDY
- INITIATE INVERTEBRATE STUDY
- INITIATE REPTILE STUDY
- EXPAND AND CONTINUE SMALL MAMMAL STUDY
- INITIATE NONGAME BIRD/RAVEN STUDY
- DEVELOP SPOTTED BAT STUDY

TECHNICAL QUESTION 1 (CONTINUED)

● DESERT TORTOISE STUDIES

- COMPLETE DESIGN OF STUDIES**
- INITIATE STUDIES**
 - POPULATION ASSESSMENT**
 - SITE CHARACTERIZATION EFFECTS STUDY**
 - HABITAT USE AND MOVEMENT**
 - FOOD HABITS**
 - PATHOLOGY/PHYSIOLOGY/DISEASE**
 - RELOCATION MONITORING**

● RADIOLOGICAL MONITORING SUPPORT STUDIES

- CONTINUE GAMEBIRD AND LAGOMORPH ABUNDANCE STUDIES**
- INITIATE CARNIVORE ABUNDANCE STUDY**

TECHNICAL QUESTION 1 (CONTINUED)

ACCOMPLISHMENTS

● PREACTIVITY SURVEYS

- 15 CONDUCTED
- 169 SEPARATE LOCATIONS
- >80 MILES OF ROAD CLEARED FOR ACCESS
- RECOMMENDED ACTIVITY ALTERATION ON 3 OF 15 SURVEYS

● SITE CHARACTERIZATION EFFECTS STUDIES

- COMPLETED AND APPROVED STUDY INTEGRATION DESIGN DOCUMENT
- VEGETATION STUDY INITIATED ON 33 OF 48 SAMPLE LOCATIONS
- SMALL MAMMAL STUDY INITIATED ON 6 OF 8 SAMPLE LOCATIONS
- NONGAME BIRD/RAVEN STUDY DESIGN APPROVED
- REPTILE STUDY DOCUMENTS PREPARED
- INVERTEBRATE STUDY DOCUMENTS PREPARED

TECHNICAL QUESTION 1 (CONTINUED)

● **DESERT TORTOISE PROGRAM**

- **SUBMITTED BIOLOGICAL ASSESSMENT (11/89)**
- **RECEIVED A NO JEOPARDY BIOLOGICAL OPINION (2/90)**
- **SUBMITTED COMMENTS ON BIOLOGICAL OPINION TO YMP (3/90)**
- **SUBMITTED ANNOTATED OUTLINE FOR YMP EMPLOYEE TRAINING (3/90)**
- **RECEIVED CHANGE ON FEDERAL HANDLING PERMIT**
- **RECEIVED CHANGE ON NEVADA DOW HANDLING PERMIT**
- **CONTINUED MONITORING OF RADIO-TAGGED TORTOISES**
- **INITIATED DESIGN OF STUDIES**

● **RADIOLOGICAL MONITORING SUPPORT STUDIES**

- **FIRST SAMPLE PERIOD COMPLETED FOR LAGOMORPH STUDY**
- **FIRST SAMPLE PERIOD COMPLETED FOR GAMEBIRD STUDY**

TECHNICAL QUESTION 2: WHAT ARE THE POTENTIAL PATHWAYS OF RADIATION TO MAN AND THE ENVIRONMENT?

STATUS

● COLLECT SAMPLES

- SMALL MAMMAL SAMPLE LOCATIONS TO BE TRAPPED TWICE**
- DEER FORAGE SAMPLING TO BE COMPLETED**

● PROVIDE DATA

- GAMEBIRD AND LAGOMORPH ABUNDANCE TO BE ASSESSED TWICE**
- CARNIVORE ABUNDANCE TO BE ASSESSED ONCE**

TECHNICAL QUESTION 2 (CONTINUED)

ACCOMPLISHMENTS

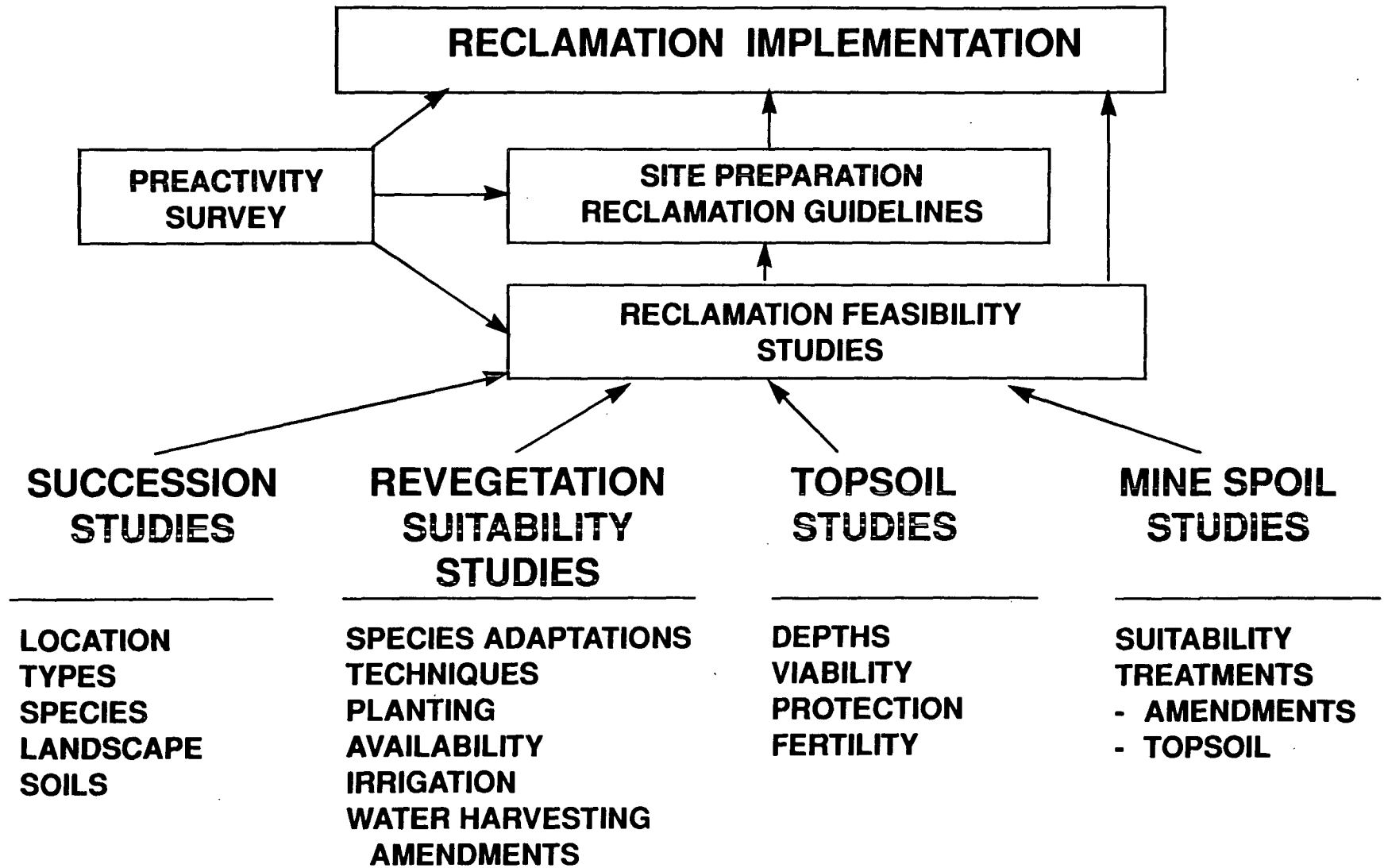
- **COLLECT SAMPLES**

- **SMALL MAMMAL LOCATIONS TRAPPED TWICE**
- **DEER FORAGE SAMPLING INITIATED**

- **PROVIDE DATA**

- **COMMENTED ON DRAFT OF RMP**
- **FIRST SAMPLE PERIOD COMPLETED FOR BOTH GAMEBIRD AND LAGOMORPH STUDIES**
- **CARNIVORE SAMPLE LOCATIONS APPROVED AND MARKED**

INTEGRATION OF RECLAMATION PROGRAM



TECHNICAL QUESTION 3: WHAT ARE THE RECLAMATION TECHNIQUES NEEDED TO RECLAIM HABITATS DISTURBED BY SITE CHARACTERIZATION ACTIVITIES?

STATUS

- **PREACTIVITY SURVEYS**
 - **CONDUCT AS REQUIRED**
- **SITE PREPARATION RECLAMATION GUIDELINES**
 - **TOPSOIL STOCKPILE RECOMMENDATION PROVIDED AS REQUIRED**
 - **EROSION CONTROL GUIDELINES PROVIDED AS REQUIRED**
- **RECLAMATION FEASIBILITY STUDIES**
 - **COMPLETE LITERATURE REVIEW**
 - **IMPLEMENT NATURAL SUCCESSION STUDY**
 - **IMPLEMENT TOPSOIL STOCKPILE STUDIES**
 - **IMPLEMENT REVEGETATION STUDIES**

TECHNICAL QUESTION 3 (CONTINUED)

ACCOMPLISHMENTS

- **PREACTIVITY SURVEYS**
 - PREVIOUSLY DISCUSSED

- **SITE PREPARATION RECLAMATION GUIDELINES**
 - TOPSOIL STOCKPILE RECOMMENDATIONS AND EROSION CONTROL GUIDELINES PROVIDED FOR PROTOTYPE DRILL HOLE, TRENCH E, AND ESF
 - EROSION CONTROL GUIDELINES INITIATED FOR TRENCH E AND ESF

- **RECLAMATION FEASIBILITY STUDIES**
 - RECLAMATION FEASIBILITY PLAN RELEASED (3/90)
 - RECLAMATION GUIDELINES DISTRIBUTED (6/89)
 - RECLAMATION IMPLEMENTATION PLAN RESUBMITTED FOR CONCURRENCE TO DOE/HQ (3/90)
 - NATIVE VEGETATION CHARACTERIZATION STUDY INITIATED
 - LITERATURE REVIEW CONTINUED

INTERDISCIPLINARY INTERACTIONS

- **PROVIDE SAMPLES AND DATA TO RADIOLOGICAL MONITORING DEPARTMENT**
- **PROVIDE PLANT AND ANIMAL INFORMATION FOR CULTURAL RESOURCE ISSUES**
- **PROVIDE DESERT TORTOISE AND RECLAMATION RECOMMENDATIONS**
- **PROVIDE BASELINE VEGETATION AND ANIMAL HABITAT DATA TO RECLAMATION PROGRAM**
- **SOILS INFORMATION SHARED AMONG PARTICIPANTS**
- **AIR QUALITY AND METEOROLOGY DATA PROVIDED FOR VARIOUS STUDIES**
- **RECEIVE WATER QUALITY/QUANTITY INFORMATION PROVIDED FOR VARIOUS BIOLOGICAL STUDIES**