

DEVELOPMENT AND MANAGEMENT CONCEPT
FOR THE
OAK ORCHARD NATIONAL WILDLIFE REFUGE

Introduction and Background

The succeeding information with attached maps presents a development and management concept for the Oak Orchard National Wildlife Refuge. The Oak Orchard National Wildlife Refuge was approved for acquisition in 1958 and is expected to comprise 10,802 acres. Acquisition as of September 1962 is 50% completed. Further acquisition by negotiation will be meager and progress toward the completion of acquisition will require condemnation.

The Refuge acquisition area encompasses a water-logged area of woods, marshes, and uplands lying about mid-way between Rochester and Buffalo in New York's lakes-plain country. Oak Orchard Creek flows from east to west through the area and is the principal source of water for development and management. The Refuge is flanked by two New York State Game Management Areas both of which are established for waterfowl. The developed Oak Orchard Game Management Area lying east has been in existence for many years, the Tonawanda Game Management Area lying south of the west end of the refuge is under acquisition at this time. Public waterfowl hunting is included in the management of the present Oak Orchard Game Management Area and is proposed for the Tonawanda Game Management Area.

Personnel were assigned to this new refuge in 1958. Some buildings obtained with land acquisition have been adapted for

temporary office, shop, equipment storage, and for employee quarters. A fairly complete equipment inventory has been assembled by purchase and acquisition from surplus. One major problem, that of reversion of the open land being acquired (former pastures, meadows, and cropland) to brush and trees, has been tackled by means of herbicides and with interim land-use practices of cropping, haying, and grazing. Boundary fencing is under way where the boundary between the refuge and private lands has been established. Biological and hydrological observations have been made on the area for a period of four years, providing information required for the preparation of refuge plans. An Interim Land-use Plan and a Soil and Moisture Conservation Plan have been prepared for the area.

Refuge Management Objectives

Primary objectives for the Oak Orchard Refuge (as submitted for approval) are waterfowl production and migration sanctuary. Development and management will therefore be directed toward providing nesting habitat for ducks and geese, and protection and food for fall and spring concentrations of ducks and Canada geese. Secondary objectives will be to provide habitat for indigenous wildlife species and for the public enjoyment of migratory birds and other wildlife resources to as great an extent as possible without interfering with the primary objectives.

Wildlife Management Objectives in terms of waterfowl populations are as follows:

| | USE DAYS | | | PEAK | |
|-------|-----------|---------|-----------|---------|------------|
| | Spring | SUMMER | FALL | NUMBERS | PRODUCTION |
| DUCKS | 2,500,000 | 500,000 | 3,000,000 | 100,000 | 6,500. |
| GEESE | 765,000 | 35,000 | 700,000 | 30,000 | 500 |

Currently spring goose use is many times use made by fall migrants probably due to absence of open-water area in the fall.

Development Concept - Water Areas

Proposed Major Pool Development and Management

As of this date the Oak Orchard Creek is the sole supply of water for use in refuge development. Stream gradient and flow velocity is low in nature. From a point four miles downstream from the refuge acquisition boundary to a point 14 miles upstream from the east boundary, the stream drops a total of only 38 feet in 25 thalweg miles. The fall through the acquisition area is approximately 13 feet at summer water levels. The area embraced by the refuge boundary has flooded each year during late winter and early spring and has served as a natural flood-control reservoir for downstream areas by reason of the bottleneck caused by the rock stream bed between the refuge boundary and the dam at Shelby, approximately 3-1/2 miles downstream from the northwest refuge boundary.

Working with this topography and with the problems that it presents, we propose in this development concept the establishment of six major pool units, five of which will be off-stream impoundments. Water surface elevations shown are the best determinations at this time for maximum management levels. The pool units can be managed at levels below this as desired.

Eventual development of the State of New York's Tonawanda Game Management Area may make it possible to bring flood or summer pumped water from the Tonawanda Creek drainage into the lower portions units 4 and 6 of our pool system via the old Feeder Canal.

In view of this possibility, we propose to maintain the present canal from our boundary at Lewiston Road to the point where it will enter our pool system.

As a necessary management practice to prevent excessively high spring flood levels in the pools, the water in all management units will be drawn down extensively at the end of the fall migration period and thru the winter the pools will be held at low levels or drained. This is for the purpose of providing space for the flood waters of late winter and early spring that presently and historically are adequate to charge all pools even in the driest years. This practice promises to preclude the development of a carp population within the impoundments. This, plus the fact that the low-flow storage volume of the stream between the refuge boundary and the impassable falls at Shelby is so slight that no source of carp re-infestation will exist. Provision for carp control at structures will be unnecessary.

Spring recharge of pool units will occur prior to or simultaneously with the spring waterfowl migration. The bulk of the area shown in the pool system as well as the remaining swamp woodland areas outside the proposed pool units has been flooded each spring season. Structures 5,7,10,13,16 and 18 are high-capacity overflow spillways (equalizers) to permit the spread of flood waters throughout the pool system. By this means it is proposed to bring pool units 1,2,3,4 and 6 (the off-stream impoundments) to full management level during the period of spring runoff and flooding (usually March 20 to April 10th). Unit 5, the one on-stream impoundment, can be flooded by closing structure 6 as soon as the danger of damaging upstream private agricultural

enterprises is past. Normal stream flow in late April or early May has been sufficient to bring this unit rapidly to management level. Unit 5 can be managed as a paddyfield area by leaving it dry or by draining it in late June and planting crops for subsequent flooding in the fall season. Flooding of Unit 5 can be carried out in the fall season by the initiation of the winter drawdown on Units 1 through 4 or by complete drainage of any one of them.

It is proposed that all units be held at about normal management levels throughout the waterfowl nesting season. After the initial spring charge offstream, Units 4 and 6 can be maintained from onstream Unit 5. While water surface elevations for Units 1 through 3 can be developed during the spring flooding, they cannot be maintained by gravity diversion through the balance of the year because of limitations in water-surface elevations in the upstream muckland farming area. Two pumps will be necessary to minimize pool surface level declines during the water deficiency period June through September. The pump for Unit 1 will benefit only Unit 1. The pump proposed for Units 2 and 3 can also serve Units 4 and 6 in the event Unit 5 is operated as a paddyfield unit or not flooded for other reasons.

Subsequent to the nesting period one or more pool units can be drained as may be required for management purposes since structures 1,6,9,12,15 and 17 will permit the independent drainage of individual pool units. It is anticipated that drainage of the pool system for the winter drawdown will commence before freeze-up during the later portion of the fall migration and can be a matter

of maintaining full management levels on the lower pools while draining the upstream units.

Upland Pond Developments

Ten sites have been identified for the development of upland ponds or small marshes ranging in size from five to 30 acres. While these developments will have only a negligible effect in water storage and supply for the major units, they are anticipated to be of high value in increasing waterfowl nesting and in serving to disperse nesting birds and migratory flocks more widely throughout the refuge cropland and grassland areas.

Development Concept--Upland Areas

Cropland Areas

Field areas for the production of corn, wheat, buckwheat, and millet have been selected on the basis of the land-use capability classification of the soils and the physical relationship of the area to refuge impoundments. It is planned to manage these areas on a crop-rotation basis which will include a sod-forming legume in the rotation. Full development of these areas will require strip cropping on the contour, clearing of hedgerows, and timber and brush clearing between shoreline areas and the crop fields.

Grassland Areas

This represents lands acquired which are essentially open lands. Management of the area for waterfowl including our interest in waterfowl nesting and the use by goose concentrations, requires open lands, especially adjacent to the water units. These are lands generally less adapted to cropping and of lower land-use capability, frequently due to poor drainage. They can

be managed as grazing or haying units, or maintained as open areas by use of herbicides. Within these broad areas so designated as grassland there are many acres of brushland and some pockets of timber that are beyond simple clearing operations. Management of grassland areas will be directed toward holding the line on reversion of the present open lands. It is our proposal to include the clearing of timber and heavy brushland within the grassland areas as a low priority item except for shoreline areas. Many acres designated as grassland have been or are currently cropped. Maintenance of these areas as open lands permits us the option of bringing them readily into cropland use if the needs of waterfowl so dictate.

Upland Game Habitat

Certain features of our waterfowl development such as our cropland areas are highly compatible with upland game. Portions of the area proposed as grassland are high-quality upland game habitat. Development to meet our waterfowl management objectives will cause loss of some high-quality upland game habitat. We have found that personnel of allied conservation agencies (the New York Conservation Department and the U.S. Soil Conservation Service) as well as many private individuals look with a critical eye at an apparent lack of concern and planning for upland game in the development of our waterfowl refuge. In recognition of these facts it seems wise to include some specific development for this resource. Areas proposed are of lower land-use capability and within which former landowners have made some plantings of blocks of evergreens. In the interest of putting land to its best use in the name of

wildlife, we propose development of these areas with plantings of food-producing shrubs and further evergreen plantings. The area so designated at the southwest portion of the refuge is one of good nesting habitat for woodcock. We recommend maintaining this as the open brushland that it now is.

Timber Screens

Planned for locations where highway traffic would disturb waterfowl on ponds or in fields. These will be planted or left standing as the case may be. Fruit and food-bearing shrubs for upland wildlife food will be incorporated in the screen rows to be planted.

Timber Clearing

This will be done where necessary for construction of dikes, trails, control structures, and other necessary development components, adjacent to cropland, and between upland ponds and field areas.

Boundary Fences

Proposed to permanently define boundaries contiguous to privately owned property. None proposed parallel to established well-defined roads.

Grazing Management Fences

Proposed where control of grazing is essential to maintenance of optimum conditions in potential goose pasture areas and to preclude reversion of open area to brush and timber.

Roads--Surfaced

Proposed where all-weather access to water management facilities is essential.

Patrol Trails--Unsurfaced

Proposed for fair-weather access for fence and boundary posting maintenance and access to agricultural areas.

Recreational Facilities

Overlook sites (observation platforms for public viewing of waterfowl concentrations and habitat), foot (nature) trails, historical sites, the picnic area, etc. are anticipated minimum requirements and considered essential.

Buildings

Considered essential as separate units are:

| | |
|--|---------------|
| Office | 26 x 36 |
| Shop and Garage | 30 x 60 |
| Conservation Education Bldg. | Standard Plan |
| Equipment Storage Bldg. | 40 x 200 |
| Oil House and Pump Equipment, Farming Supplies, Storage | 30 x 40 |
| Residence--One at Headquarters | |

Staff

| | |
|-------------------------------|-----------------------------------|
| Refuge Manager GS-11 | Clerk GS-4 |
| Assistant Refuge Manager GS-9 | Student Assistant GS-3, GS-4 |
| Foreman | Refuge Manager Trainee GS-5, GS-7 |
| Mechanic | |
| Maintenanceman | |
| Maintenanceman | |
| Temporaries | |

Development Costs

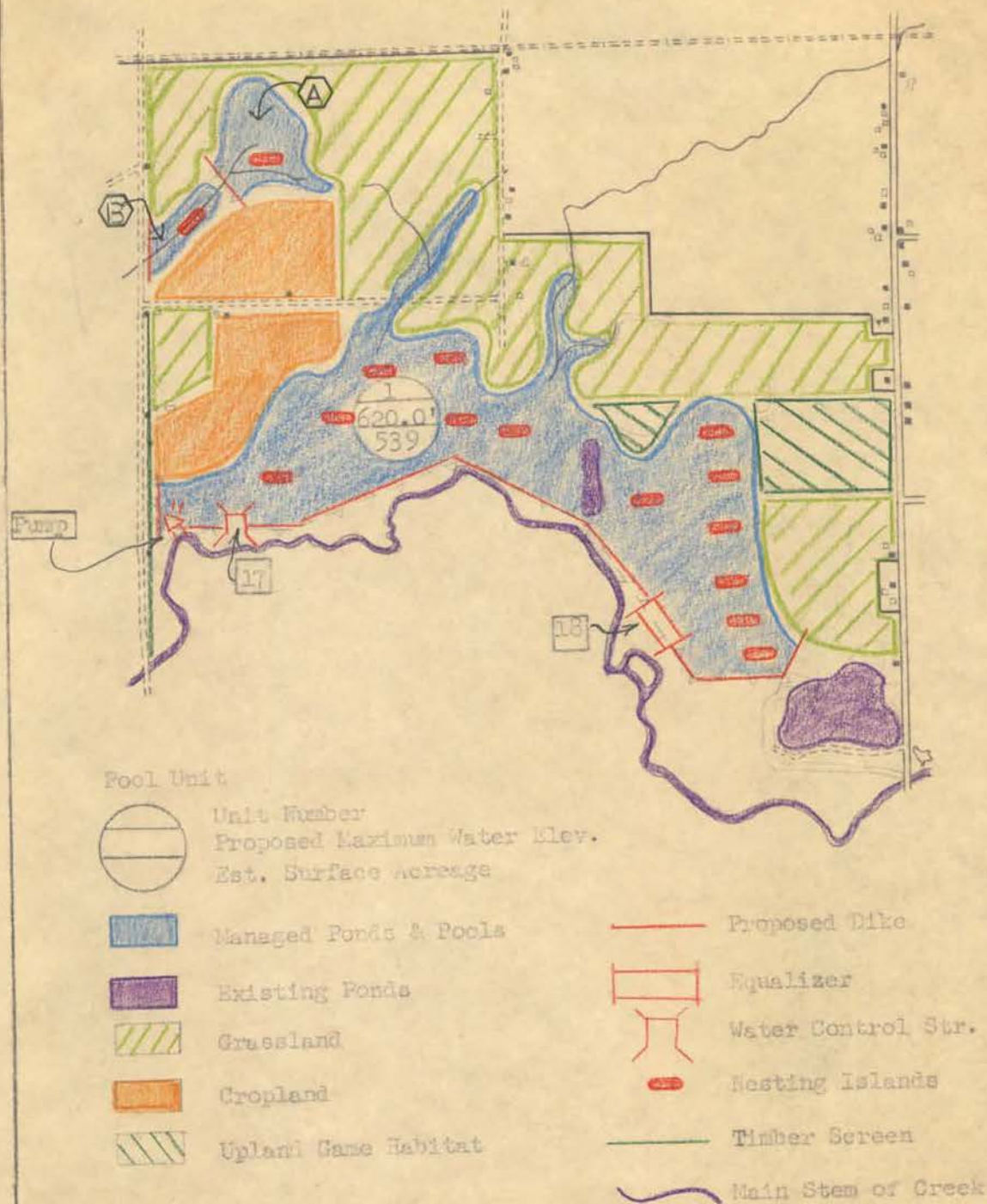
The succeeding tabulations give a unit by unit cost of:

- A. Basic development requirements that include necessary impoundment and water supply structures; roads for operation and maintenance; boundary fence and posting and buildings.
- B. Management and operational requirements that will improve or enhance waterfowl production; waterfowl food production; and to permit full attainment of Refuge objectives.

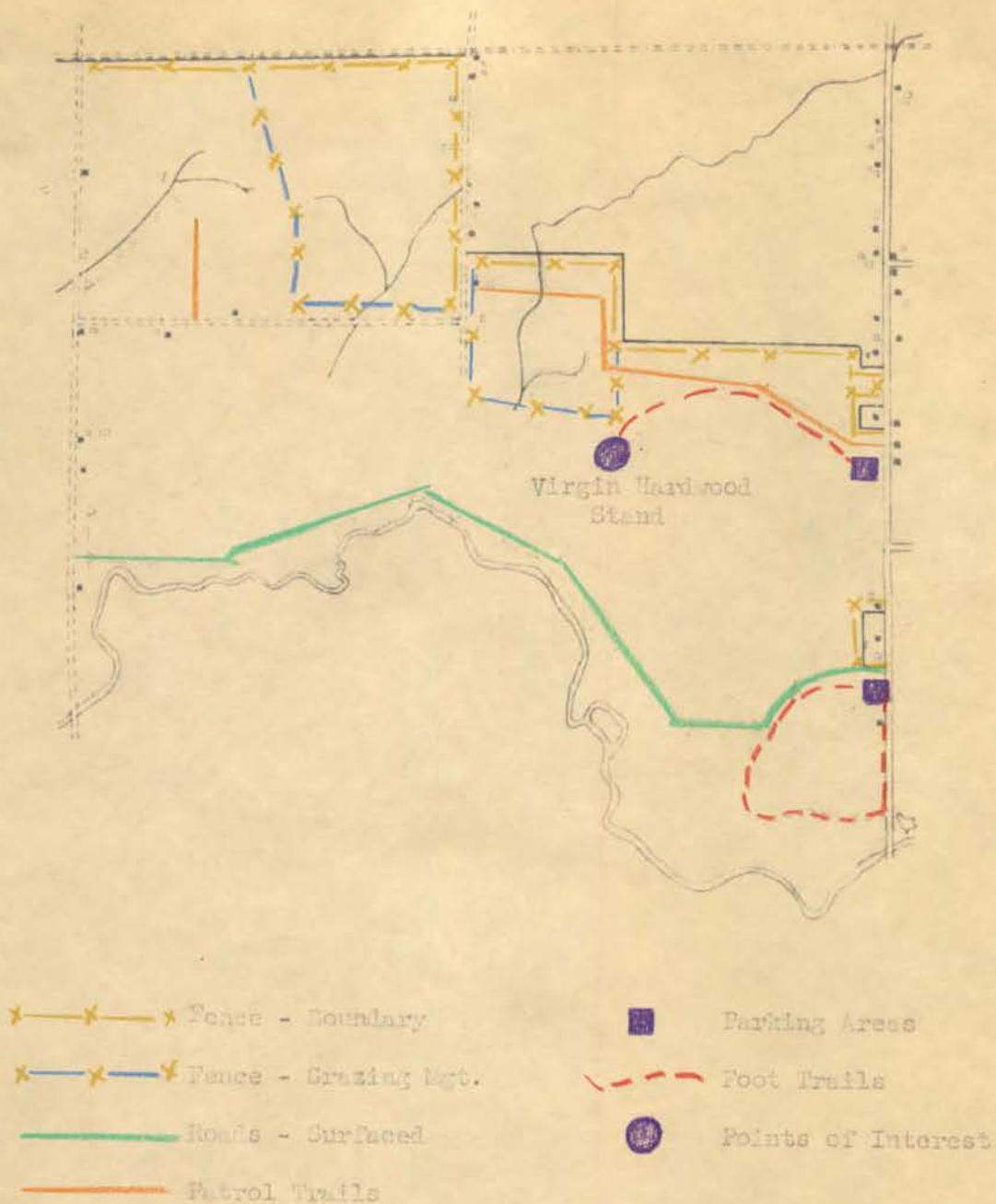
DEVELOPMENT COST BREAKDOWN - UNIT 1

| BASIC DEVELOPMENT REQUIREMENTS: | NO. UNITS | COST PER UNIT | WORK COST | ENG. COST | TOTAL COST |
|---|--------------|---------------------|--------------|--------------|---------------|
| Dike, 3:1 - 5:1, 7' high, 10' top | | | | | |
| Timber Clearing & Stripping | 2 mi. | 10,000 | 20,000 | 3,000 | 23,000 |
| Earthwork | 2 mi. | 35,000 | 70,000 | 10,500 | 80,500 |
| Equalizer | 1 ea. | 20,000 | 20,000 | 3,000 | 23,000 |
| Control Structure & Drain | 1 ea. | 15,000 | 15,000 | 2,300 | 17,300 |
| Pump | 1 ea. | 20,000 | 20,000 | 3,000 | 23,000 |
| Upland Ponds | | | | | |
| A | 1 ea. | 6,000 | 6,000 | 900 | 6,900 |
| B | 1 ea. | 5,500 | 5,500 | 800 | 6,300 |
| Road (surfaced) | 3 mi. | 5,280 | 15,840 | 2,360 | 18,200 |
| Boundary Fence | | | | | |
| Hedgerow Clearing | 2.5 mi. | 400 | 1,000 | 100 | 1,100 |
| Fence Construction | 2.5 mi. | 900 | 2,250 | 350 | 2,600 |
| Boundary Posting | 4.3 mi. | 100 | 430 | -- | 430 |
| Clearing in Pool Areas, Adj. cropland Timber slashing | 20 ac. | 200 | 4,000 | 600 | 4,600 |
| TOTAL | | | 180,020 | 26,910 | 206,930 |
| MANAGEMENT & OPERATIONAL REQUIREMENTS: | | | | | |
| Patrol Trails (Unsurfaced) | 1.75 mi. | 2,000 | 3,500 | 500 | 4,000 |
| Cropland Development - 156 Ac. | | | | | |
| Brush and Hedgerow Clearing | 20 ac. | 100 | 2,000 | -- | 2,000 |
| Soil and Moisture Practices | 156 ac. | 30 | 4,680 | -- | 4,680 |
| Grassland Development - 614 Ac. | | | | | |
| Brush & Timber Clearing | 50 ac. | 100 | 5,000 | -- | 5,000 |
| Soil and Moisture Practices | 200 ac. | 50 | 10,000 | -- | 10,000 |
| Interior Fencing (Grazing Mgt.) | 3 mi. | 900 | 2,700 | -- | 2,700 |
| Pothole Development | 3 ea. | 300 | 900 | 100 | 1,000 |
| Timber Screens | .6 mi. | 600 | 360 | -- | 360 |
| Nesting Islands | 13 ea. | 2,000 | 26,000 | 1,000 | 27,000 |
| Upland Wildlife Development | 90 ac. | 80 | 7,200 | -- | 7,200 |
| Recreational Development | | | | | |
| Nature Trail & Parking Area (Hardwood timber Area) | 1 ea. | 3,000 | 3,000 | 500 | 3,500 |
| Nature Trail & Parking Area (Swallow Hollow Area) | 1 ea. | 4,000 | 4,000 | 600 | 4,600 |
| TOTAL | | | 69,340 | 2,700 | 72,040 |
| Basic Development Requirements | | | 180,020 | 26,910 | 206,930 |
| Mgt. & Operational Requirements | | | 69,340 | 2,700 | 72,040 |
| GRAND TOTAL - Unit 1 | | | 249,360 | 29,610 | 278,970 |

OAK ORCHARD NATIONAL WILDLIFE REFUGE
DEVELOPMENT PLAN



OLYMPIAN NATIONAL WILDLIFE REFUGE
DEVELOPMENT PLAN



DEVELOPMENT COST BREAKDOWN - UNIT 2

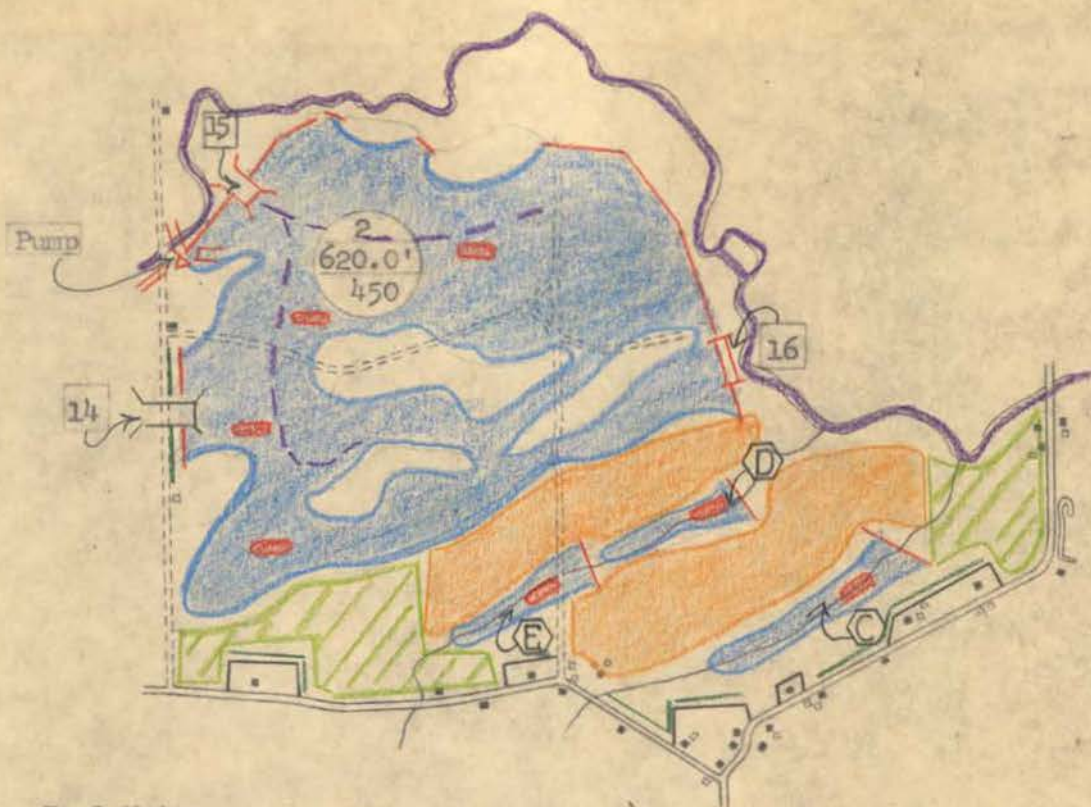
| | NO. | COST | WORK | ENG. | TOTAL |
|-----------------------------------|---------|----------|----------------|---------------|----------------|
| BASIC DEVELOPMENT REQUIREMENTS: | UNITS | PER UNIT | COST | COST | COST |
| Dike, 3:1 - 5:1, 7' high, 12' top | | | | | |
| Timber Clearing & Stripping | 1.6 mi. | 10,000 | 16,000 | 2,400 | 18,400 |
| Earthwork | 1.6 mi. | 38,000 | 60,800 | 9,200 | 70,000 |
| Equalizer | 1 ea. | 20,000 | 20,000 | 3,000 | 23,000 |
| Control Structure & Drain | 1 ea. | 15,000 | 15,000 | 2,300 | 17,300 |
| Ditch (Pool Drainage) | | | | | |
| Timber Clearing | 1.1 mi. | 2,000 | 2,200 | 300 | 2,500 |
| Earthwork excavation | 1.1 mi. | 7,500 | 8,250 | 1,250 | 9,500 |
| Pump (Cost shared w/Units 3 & 4) | 1 ea. | 20,000 | 8,000 | 1,200 | 9,200 |
| Upland Ponds | | | | | |
| C | 1 ea. | 5,000 | 5,000 | 800 | 5,800 |
| D | 1 ea. | 5,000 | 5,000 | 800 | 5,800 |
| E | 1 ea. | 6,500 | 6,500 | 1,000 | 7,500 |
| Road (surfaced) | 2.8 mi. | 5,280 | 14,784 | 2,216 | 17,000 |
| Boundary Fence - 6,387' | | | | | |
| Fence Construction | 1.2 mi. | 900 | 1,080 | 220 | 1,300 |
| Boundary Posting | 3.1 mi. | 100 | 310 | -- | 310 |
| Clearing in Pool Areas, Adj. | | | | | |
| Cropland | | | | | |
| Timber slashing | 20 ac. | 200 | 4,000 | 660 | 4,660 |
| TOTAL | | | 166,924 | 25,346 | 192,270 |

MANAGEMENT & OPERATIONAL REQUIREMENTS:

| | | | | | |
|--|---------|-------|---------------|--------------|---------------|
| Patrol Trails (Unsurfaced) | 1.2 mi. | 2,000 | 2,400 | 400 | 2,800 |
| Cropland Development | | | | | |
| Brush and Hedgerow Clearing | 15 ac. | 150 | 2,250 | -- | 2,250 |
| Soil and Moisture Practices | 286 ac. | 50 | 14,300 | -- | 14,300 |
| Grassland Development | | | | | |
| Brush & Timber Clearing | 20 ac. | 100 | 2,000 | -- | 2,000 |
| Soil and Moisture Practices | 50 ac. | 50 | 2,500 | -- | 2,500 |
| Timber Screens | 1.7 mi. | 600 | 1,020 | -- | 1,020 |
| Nesting Islands | 4 ea. | 2,000 | 8,000 | 1,200 | 9,200 |
| Recreational Development | | | | | |
| Nature Trail & Parking Area | 1 ea. | 3,000 | 3,000 | 500 | 3,500 |
| (Parking Area also serves Trail to Sour Springs on Unit 3) | | | | | |
| TOTAL | | | 35,470 | 2,100 | 37,570 |

| | | | |
|---------------------------------|----------------|---------------|----------------|
| Basic Development Requirements | 166,924 | 25,346 | 192,270 |
| Mgt. & Operational Requirements | 35,470 | 2,100 | 37,570 |
| GRAND TOTAL - Unit 2 | 202,394 | 27,446 | 229,840 |

OAK ORCHARD NATIONAL WILDLIFE REFUGE
DEVELOPMENT PLAN



Pool Units



Unit Number
Proposed maximum water surface elev.
Est. Surface Acreage



Managed Ponds & Pools



Grassland



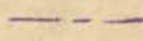
Cropland



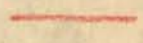
Timber Screen



Main Stem of Creek



Drainage Ditches



Proposed Dikes



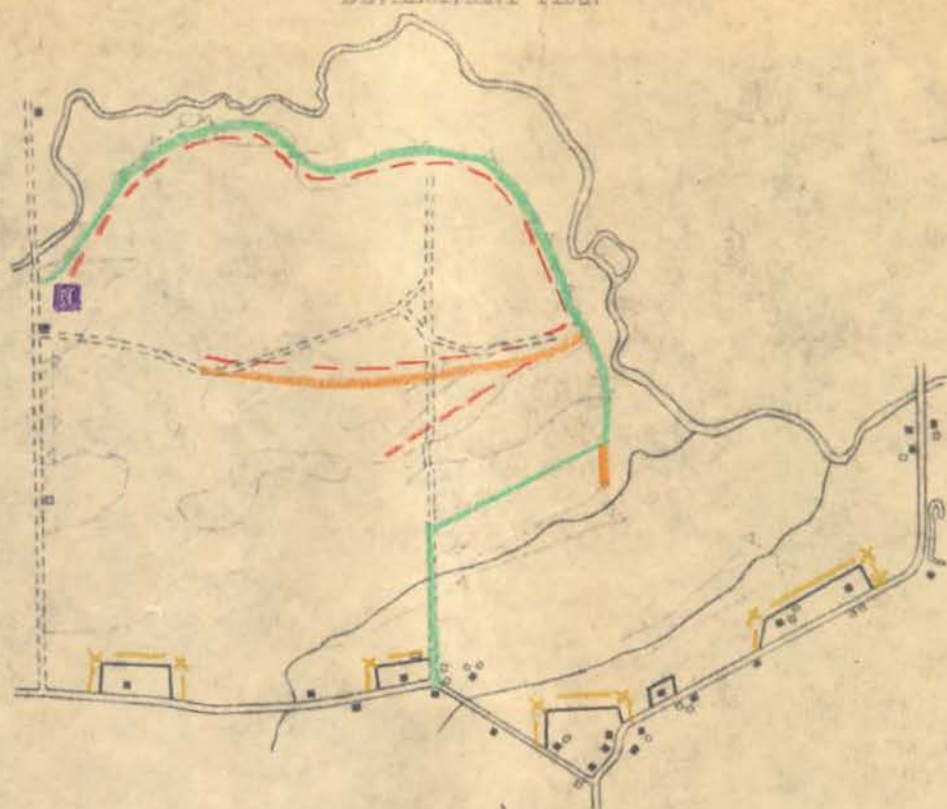
Equalizer



Water Control Str.

Nesting Islands

OAK ORCHARD NATIONAL WILDLIFE REFUGE DEVELOPMENT PLAN



✶✶✶ Fence - Boundary

— Roads - Surfaced

— Patrol Trails

■ Parking Area

- - - Foot Trails

DEVELOPMENT COST BREAKDOWN - UNIT 3

| BASIC DEVELOPMENT REQUIREMENTS: | NO. UNITS | COST PER UNIT | WORK COST | ENG. COST | TOTAL COST |
|--------------------------------------|--------------|---------------------|--------------|--------------|---------------|
| Dike, 3:1 - 5:1, 7' high, 10' top | | | | | |
| Timber Clearing & Stripping | 1.6 mi. | 10,000 | 16,000 | 2,400 | 18,400 |
| Earthwork | 2 mi. | 35,000 | 70,000 | 10,500 | 80,500 |
| Water Supply Structure (from Unit 2) | 1 ea. | 7,000 | 7,000 | 1,000 | 8,000 |
| Equalizer | 1 ea. | 20,000 | 20,000 | 3,000 | 23,000 |
| Control Structure & Drain | 1 ea. | 15,000 | 15,000 | 2,300 | 17,300 |
| Ditch (Pool Drainage) | | | | | |
| Timber Clearing | 1 mi. | 2,000 | 2,000 | 300 | 2,300 |
| Earthwork excavation | 1 mi. | 7,500 | 7,500 | 1,100 | 8,600 |
| Pump (Cost shared w/Units 2 & 4) | 1 ea. | 20,000 | 6,000 | 900 | 6,900 |
| Upland Ponds F | 1 ea. | 5,500 | 5,500 | 800 | 6,300 |
| G | 1 ea. | 6,000 | 6,000 | 900 | 6,900 |
| H | 1 ea. | 4,500 | 4,500 | 700 | 5,200 |
| I | 1 ea. | 4,500 | 4,500 | 700 | 5,200 |
| J | 1 ea. | 4,500 | 4,500 | 700 | 5,200 |
| Road (surfaced) | 1.25 mi. | 5,280 | 6,600 | 1,000 | 7,600 |
| Boundary Fence | | | | | |
| Hedgerow Clearing | 1.3 mi. | 400 | 520 | 80 | 600 |
| Fence Construction | 1.7 mi. | 900 | 1,530 | 270 | 1,800 |
| Boundary Posting | 2.5 mi. | 100 | 250 | -- | 250 |
| TOTAL | | | 177,400 | 26,650 | 204,050 |

MANAGEMENT & OPERATIONAL
REQUIREMENTS:

| | | | | | |
|-------------------------------------|---------|-------|--------|-------|--------|
| Patrol Trails (Unsurfaced) | .6 mi. | 2,000 | 1,200 | 180 | 1,380 |
| Grassland Development | | | | | |
| Brush & Timber Clearing | 100 ac. | 100 | 10,000 | -- | 10,000 |
| Soil and Moisture Practices | 200 ac. | 50 | 10,000 | -- | 10,000 |
| Interior Fencing (Grazing Mgt.) | 5.1 mi. | 900 | 4,590 | -- | 4,590 |
| Pothole Development | 10 ea. | 300 | 3,000 | 500 | 3,500 |
| Timber Screens | .6 mi. | 600 | 360 | -- | 360 |
| Nesting Islands | 3 ea. | 2,000 | 6,000 | 900 | 6,900 |
| Upland Wildlife Development | 60 ac. | 80 | 4,800 | -- | 4,800 |
| Recreational Development | | | | | |
| Trail, Sour Springs Historical Site | 1 ea. | 1,500 | 1,500 | -- | 1,500 |
| Parking Area - Overlook Goose | | | | | |
| Conc. Site | 1 ea. | 2,000 | 2,000 | 300 | 2,300 |
| TOTAL | | | 43,450 | 1,880 | 45,330 |

| | | | |
|---------------------------------|---------|--------|---------|
| Basic Development Requirements | 177,400 | 26,650 | 204,050 |
| Mgt. & Operational Requirements | 43,450 | 1,880 | 45,330 |
| GRAND TOTAL - Unit 3 | 220,850 | 28,530 | 249,380 |

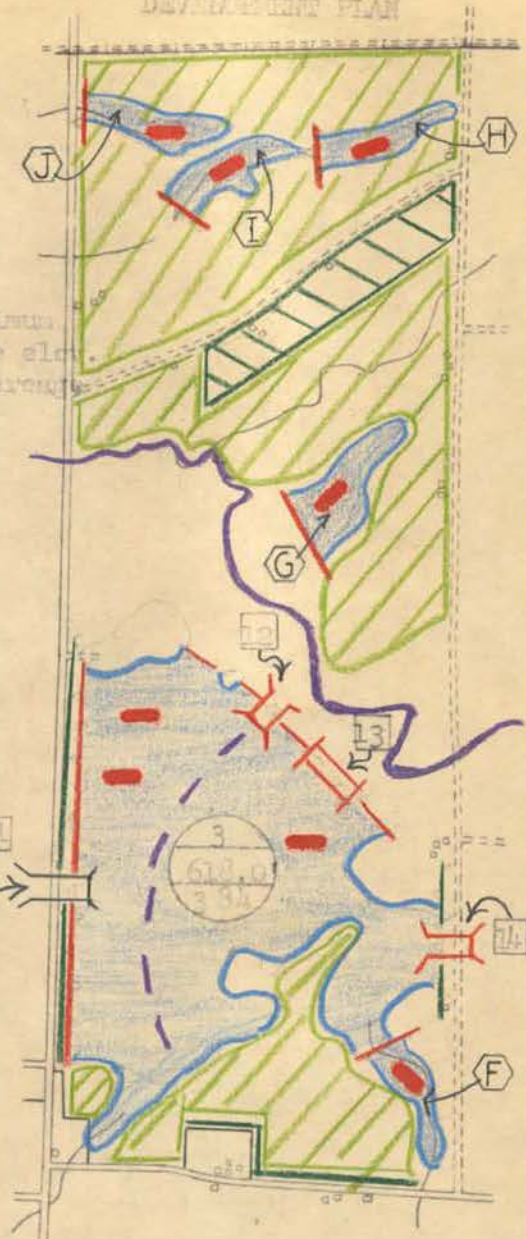
ONTARIO NATIONAL WILDLIFE REFUGE DEVELOPMENT PLAN

Pool Unit



Unit No.
Proposed Maximum
water surface elev.
Est. Surf. Area

Water supply str. to
Unit 4.



Managed Ponds & Pools



Grassland



Upland Game Habitat



Timber Screen



Main Stem of Creek

Drainage Ditch

Proposed Dike



Equalizer



Water Control Str.

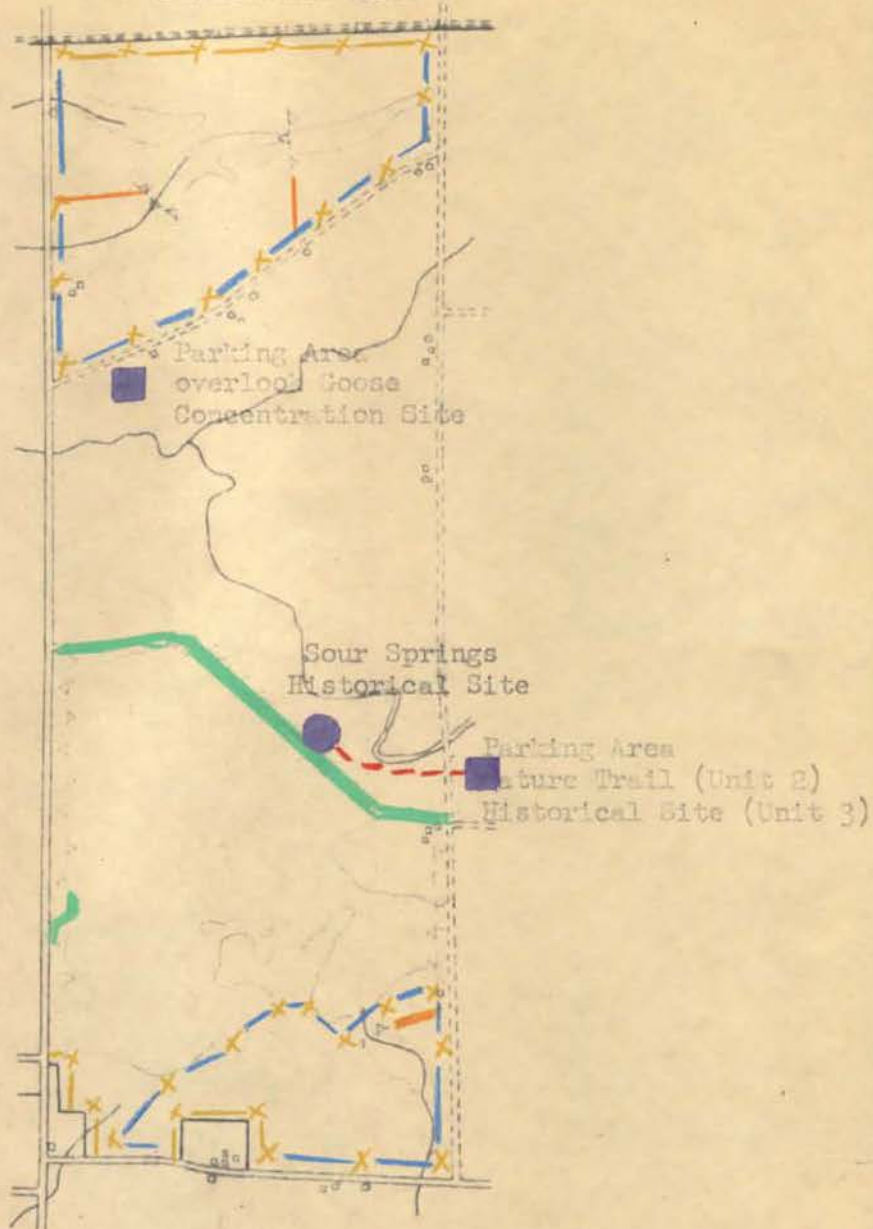


Nesting Islands

SCALE 1" = 40 CHAINS

UNIT 3

OAK ORCHARD NATIONAL WILDLIFE REFUGE DEVELOPMENT PLAN



*-x-x-x Fence - Boundary

*-x-x-x Fence - Grazing Mgt.

— Roads - Surfaced

— Patrol Trail

■ Parking Area

- - - Foot Trail

● Point of Interest

DEVELOPMENT COST BREAKDOWN - UNIT 4

| BASIC DEVELOPMENT REQUIREMENTS: | NO. UNITS | COST PER UNIT | WORK COST | ENG. COST | TOTAL COST |
|--|--------------|---------------------|--------------|--------------|---------------|
| Dike, 3:1 - 5:1, 7' high, 10' top | | | | | |
| Timber Clearing & Stripping | 1.9 mi. | 10,000 | 19,000 | 2,800 | 21,800 |
| Earthwork | 1.9 mi. | 35,000 | 66,500 | 10,000 | 76,500 |
| Water Supply Structure (from Unit 3) | 1 ea. | 7,000 | 7,000 | 1,000 | 8,000 |
| Equalizer | 2 ea. | 20,000 | 40,000 | 6,000 | 46,000 |
| Control Structure & Drain | 1 ea. | 15,000 | 15,000 | 2,300 | 17,300 |
| Ditch (Pool Drainage) | | | | | |
| Timber Clearing | 3.1 mi. | 2,000 | 6,200 | 900 | 7,100 |
| Earthwork excavation | 3.1 mi. | 7,500 | 23,250 | 3,450 | 26,700 |
| Drain, Cost of double dike, Units 5 and 6 | 1 mi. | 35,000 | 35,000 | 5,300 | 40,300 |
| Road, on dike | 1 mi. | 5,280 | 5,280 | 820 | 6,100 |
| Pump (Cost shared with Units 2 & 3) | 1 ea. | 20,000 | 6,000 | 900 | 6,900 |
| Road (surfaced) | 1.5 mi. | 5,280 | 7,920 | 1,180 | 9,100 |
| Boundary Fence | | | | | |
| Hedgerow Clearing | 1.1 mi. | 400 | 440 | 60 | 500 |
| Fence Construction | 2.1 mi. | 900 | 1,890 | 310 | 2,200 |
| Boundary Posting | 3 mi. | 100 | 300 | -- | 300 |
| TOTAL | | | 233,780 | 35,020 | 268,800 |

MANAGEMENT & OPERATIONAL
REQUIREMENTS:

| | | | | | |
|-------------------------------------|--------|-------|--------|-------|--------|
| Patrol Trails (Unsurfaced) | .4 mi. | 2,000 | 800 | 120 | 920 |
| Grassland Development | | | | | |
| Brush & Timber Clearing | 22 ac. | 100 | 2,200 | -- | 2,200 |
| Soil and Moisture Practices | 75 ac. | 50 | 3,750 | -- | 3,750 |
| Pothole Development | 4 ea. | 300 | 1,200 | 180 | 1,380 |
| Nesting Islands | 4 ea. | 1,500 | | | |
| | 6 ea. | 2,000 | 18,000 | 2,700 | 20,700 |
| Upland Wildlife Development | 70 ac. | 80 | 5,600 | -- | 5,600 |
| Recreational Development | | | | | |
| Picnic Facilities at Refuge Hdqtrs. | 1 ea. | 2,000 | 2,000 | 300 | 2,300 |
| TOTAL | | | 33,550 | 3,300 | 36,850 |

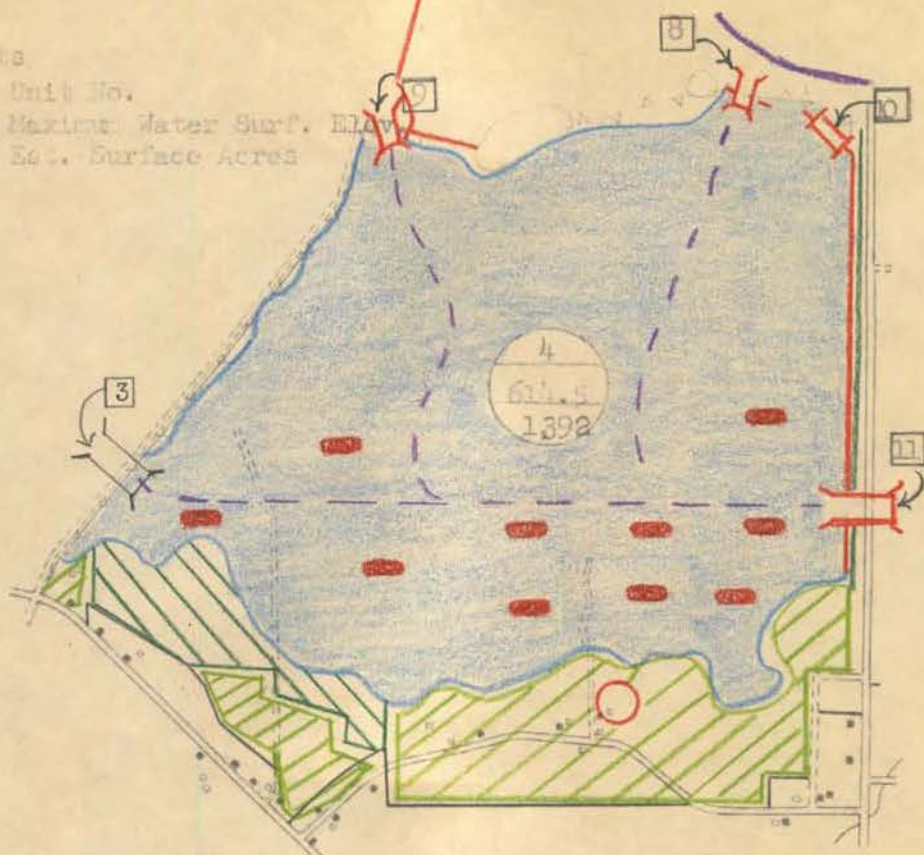
| | | | |
|---------------------------------|---------|--------|---------|
| Basic Development Requirements | 233,780 | 35,020 | 268,800 |
| Mgt. & Operational Requirements | 33,550 | 3,300 | 36,850 |
| GRAND TOTAL - Unit 4 | 267,330 | 38,320 | 305,650 |

OAK CREEK NATIONAL WILDLIFE REFUGE DIVULGEMENT PLAN

Pool Units



Unit No.
Maximum Water Surf. Elev.
Est. Surface Acres



Proposed Head Barriers



Managed Ponds & Pools



Grassland



Upland Game Habitat



Timber



Drainage Ditches



Proposed Dikes



Equalizers

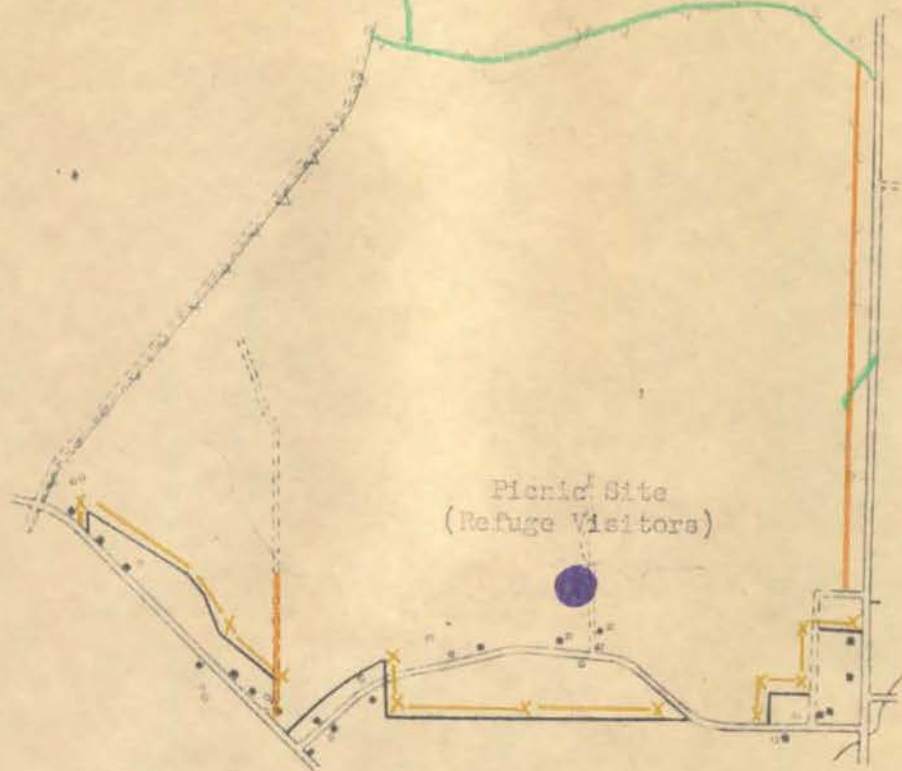


Water Control Str.



Nesting Island

OAK ORCHARD NATIONAL WILDLIFE REFUGE DEVELOPMENT PLAN



- x — x — x Fence - Boundary
- Roads - Surfaced
- Patrol Trail
- Picnic Site

DEVELOPMENT COST BREAKDOWN - UNIT 5

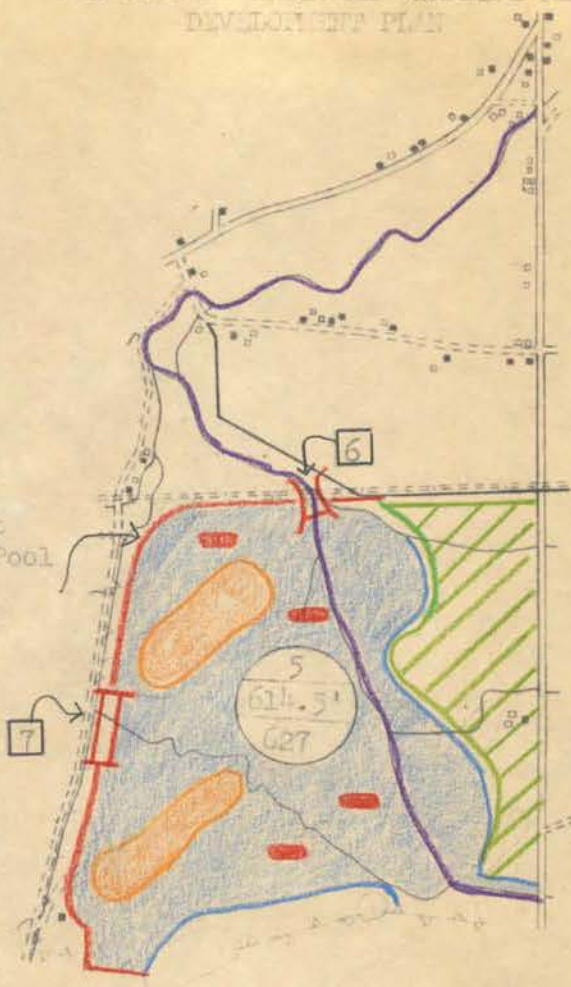
| BASIC DEVELOPMENT REQUIREMENTS: | NO. UNITS | COST PER UNIT | WORK COST | ENG. COST | TOTAL COST |
|---------------------------------------|--------------|---------------------|--------------|--------------|---------------|
| Dike, 3:1 - 5:1. 7' high, 10' top | | | | | |
| Timber Clearing & Stripping | .4 mi. | 10,000 | 4,000 | 600 | 4,600 |
| Earthwork | .65 mi. | 35,000 | 22,750 | 3,450 | 26,200 |
| Water Supply Structure (from Unit 4) | 1 ea. | 7,000 | 7,000 | 1,000 | 8,000 |
| Control Structure & Drain | 1 ea. | 15,000 | 15,000 | 2,300 | 17,300 |
| Road (surfaced) | .5 mi. | 5,280 | 2,640 | 410 | 3,050 |
| Boundary Fence | | | | | |
| Hedgerow Clearing | .6 mi. | 400 | 240 | 40 | 280 |
| Fence Construction | 1 mi. | 900 | 900 | 140 | 1,040 |
| Boundary Posting | 2 mi. | 100 | 200 | -- | 200 |
| Clearing in Pool Areas, Adj. cropland | | | | | |
| Brush Clearing | 20 ac. | 100 | 2,000 | 400 | 2,400 |
| Timber slashing | 20 ac. | 200 | 4,000 | 600 | 4,600 |
| TOTAL | | | 58,730 | 8,940 | 67,670 |

MANAGEMENT & OPERATIONAL
REQUIREMENTS

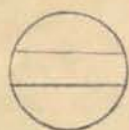
| | | | | | |
|---------------------------------|---------|-------|--------|-------|--------|
| Patrol Trails (Unsurfaced) | .25 mi. | 2,000 | 500 | 100 | 600 |
| Cropland Development | | | | | |
| Brush and Hedgerow Clearing | 25 ac. | 100 | 2,500 | -- | 2,500 |
| Soil and Moisture Practices | 50 ac. | 50 | 2,500 | -- | 2,500 |
| Grassland Development | | | | | |
| Brush & Timber Clearing | | | | | |
| Soil and Moisture Practices | 60 ac. | 50 | 3,000 | -- | 3,000 |
| Interior Fencing (Grazing Mgt.) | 2.4 mi. | 900 | 2,160 | -- | 2,160 |
| Nesting Islands | 4 ea. | 1,500 | 6,000 | 900 | 6,900 |
| TOTAL | | | 16,660 | 1,000 | 17,660 |
| Basic Development Requirements | | | 58,730 | 8,940 | 67,670 |
| Mgt. & Operational Requirements | | | 16,660 | 1,000 | 17,660 |
| GRAND TOTAL - Unit 5 | | | 75,390 | 9,940 | 85,330 |

OAK ORCHARD NATIONAL WILDLIFE REFUGE
DEVELOPMENT PLAN

Dike and Structure
South of this point
charged to Unit 4 Pool
for pool drainage.



Pool Units



Unit Number
Proposed Maximum Water Surf. Elev.
Est. Surface Acres



Managed Ponds & Pools



Grassland



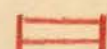
Cropland



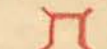
Main Stem of Creek



Proposed Dikes



Equalizer



Water Control Str.



Nesting Islands

OAK ORCHARD NATIONAL WILDLIFE REFUGE
DEVELOPMENT PLAN



- x—x—x Fence - Boundary
- x—x—x Fence - Grazing Mgt.
- Roads - Surfaced
- Patrol Trail

DEVELOPMENT COST BREAKDOWN - UNIT 6

| | NO. | COST | WORK | ENG. | TOTAL |
|--------------------------------------|---------|----------|---------|--------|---------|
| BASIC DEVELOPMENT REQUIREMENTS: | UNITS | PER UNIT | COST | COST | COST |
| Dike, 3:1 - 5:1, 6' high, 12' top | | | | | |
| Timber Clearing & Stripping | 1 mi. | 10,000 | 10,000 | 1,500 | 11,500 |
| Earthwork | 2.5 mi. | 30,000 | 75,000 | 11,000 | 86,000 |
| Water Supply Structure (from Unit 4) | 1 ea. | 7,000 | 7,000 | 1,000 | 8,000 |
| Inverted Syphon (Unit 5 to 6) | 1 ea. | 13,000 | 13,000 | 2,000 | 15,000 |
| Equalizer | 1 ea. | 20,000 | 20,000 | 3,000 | 23,000 |
| Control Structure & Drain | 2 ea. | 15,000 | 30,000 | 4,500 | 34,500 |
| Ditch (Pool Drainage) | | | | | |
| Timber Clearing | 2 mi. | 2,000 | 4,000 | 600 | 4,600 |
| Earthwork excavation | 2.9 mi. | 7,500 | 21,750 | 3,250 | 25,000 |
| Road (surfaced) | 2.8 mi. | 5,280 | 14,784 | 2,116 | 16,900 |
| Boundary Fence | | | | | |
| Hedgerow Clearing | 2.4 mi. | 400 | 960 | 140 | 1,100 |
| Fence Construction | 4.1 mi. | 900 | 3,690 | 560 | 4,250 |
| Boundary Posting | 6.3 mi. | 100 | 630 | -- | 630 |
| Clearing in Pool Areas | | | | | |
| Brush Clearing | 250 ac. | 150 | 37,500* | 5,500 | 43,000 |
| Timber slashing | 10 ac. | 200 | 2,000 | -- | 2,000 |
| TOTAL | | | 240,314 | 35,166 | 275,480 |

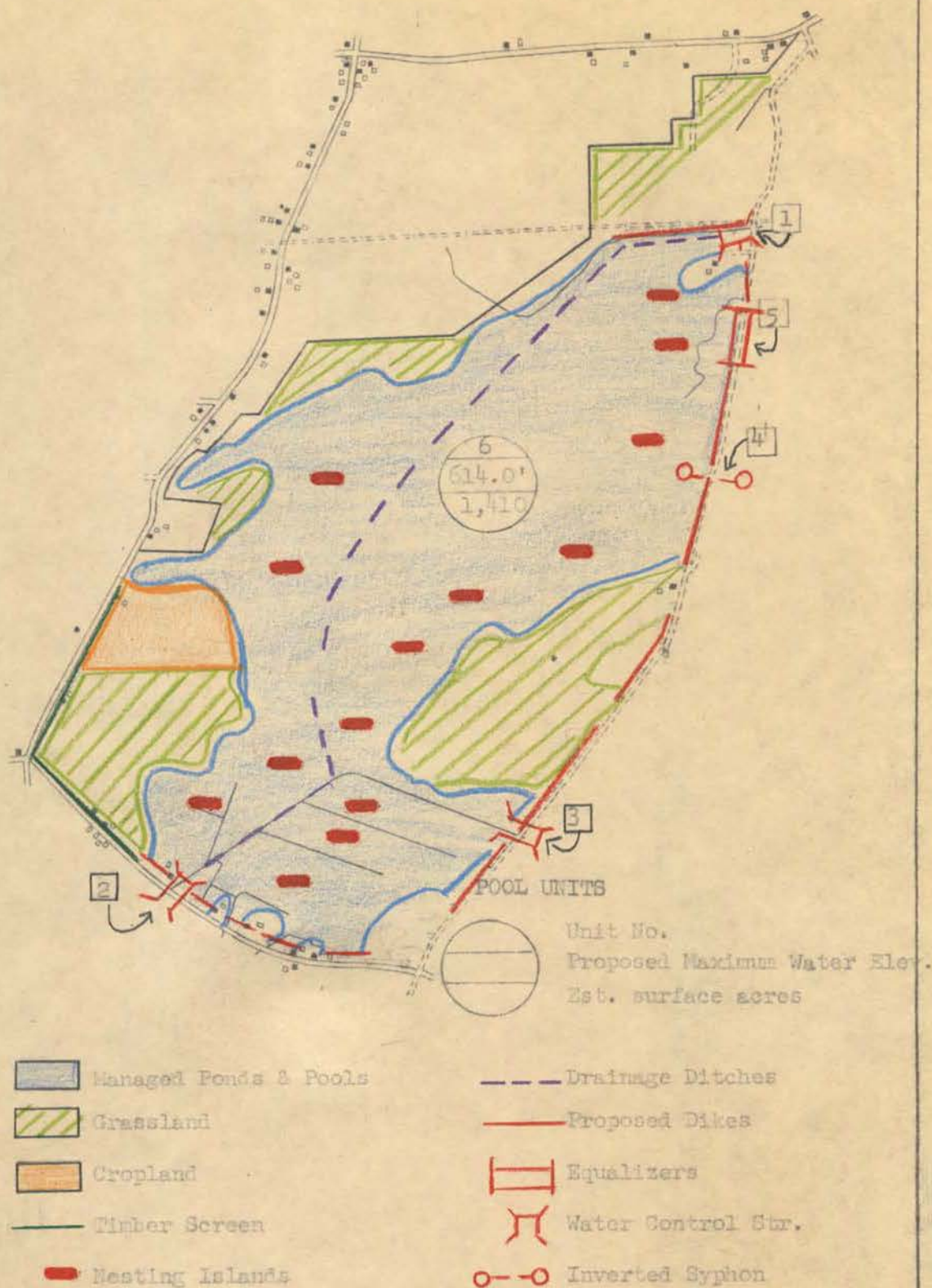
MANAGEMENT & OPERATIONAL
REQUIREMENTS:

| | | | | | |
|-----------------------------------|---------|-------|--------|-------|--------|
| Patrol Trails (Unsurfaced) | 4 mi. | 2,000 | 8,000 | 600 | 8,600 |
| Cropland Development | | | | | |
| Brush and Hedgerow Clearing | 4 ac. | 100 | 400 | -- | 400 |
| Soil and Moisture Practices | 60 ac. | 40 | 2,400 | -- | 2,400 |
| Grassland Development | | | | | |
| Brush & Timber Clearing | 100 ac. | 100 | 10,000 | -- | 10,000 |
| Soil & Moisture Practices | 100 ac. | 50 | 5,000 | -- | 5,000 |
| Timber Screens | .75 mi. | 600 | 450 | 70 | 520 |
| Nesting Islands | 8 ea. | 1,500 | | | |
| | 6 ea. | 2,000 | 24,000 | 3,600 | 27,600 |
| Recreational Development | | | | | |
| Parking Area - Waterfowl Overlook | 1 ea. | 2,500 | 2,500 | 370 | 2,870 |
| Observation Tower | 1 ea. | 2,500 | 2,500 | 370 | 2,870 |
| TOTAL | | | 55,250 | 5,010 | 60,260 |

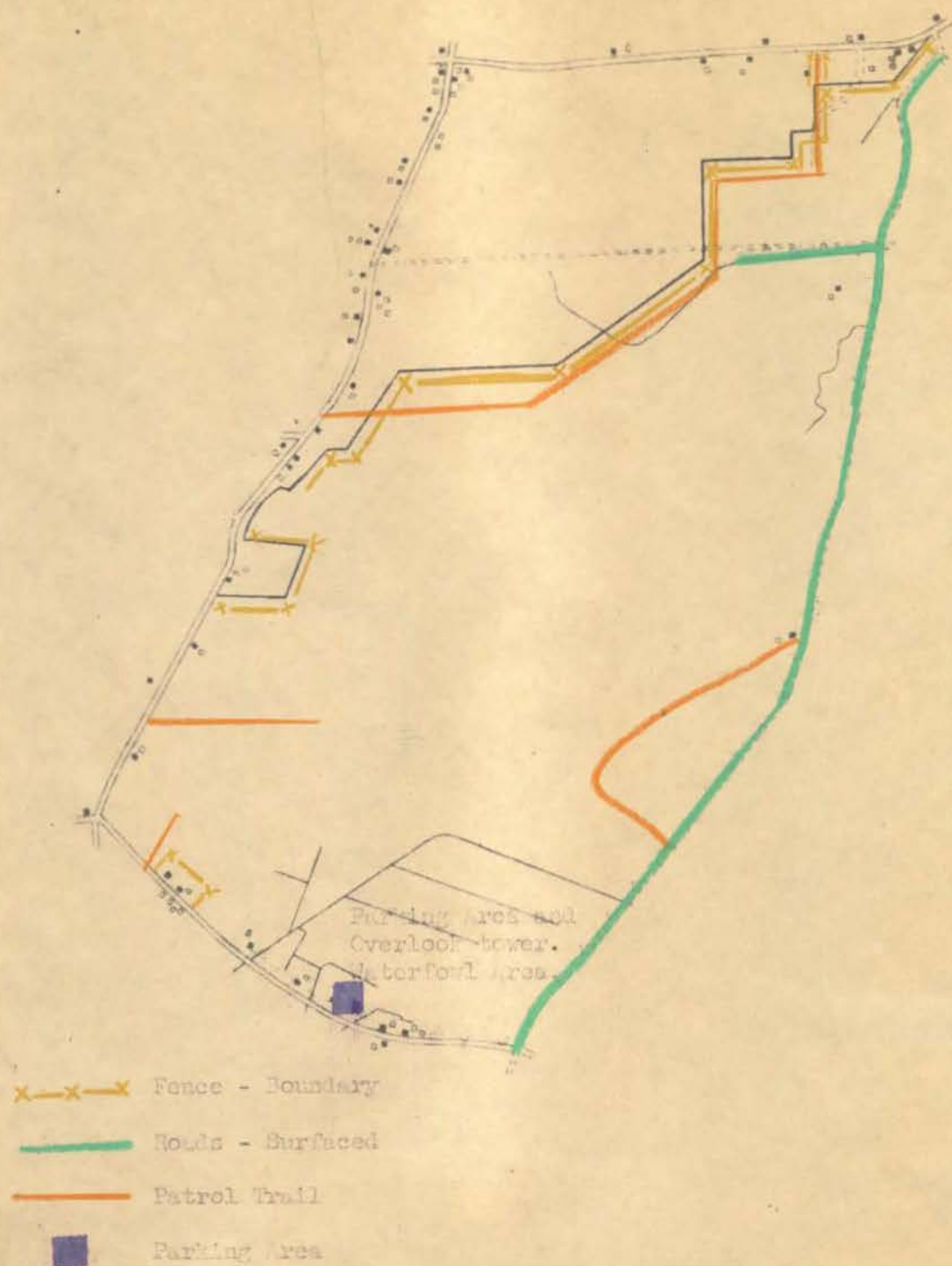
| | | | |
|---------------------------------|---------|--------|---------|
| Basic Development Requirements | 240,314 | 35,166 | 275,480 |
| Mgt. & Operational Requirements | 55,250 | 5,010 | 60,260 |
| GRAND TOTAL - Unit 6 | 295,564 | 40,176 | 335,740 |

*--Should justify a Crossville Clearing Blade.

OAK ORCHARD NATIONAL WILDLIFE REFUGE DEVELOPMENT PLAN



OAK ORCHARD NATIONAL WILDLIFE REFUGE DEVELOPMENT PLAN



COST OF HEADQUARTER FACILITIES

| <u>BASIC DEVELOPMENT REQUIREMENTS</u> | <u>WORK COST</u> | <u>ENG. COST</u> | <u>TOTAL COST</u> |
|---|----------------------|----------------------|-----------------------|
| Office 26' x 36' | 25,000 | 4,000 | 29,000 |
| Shop and Garage 30' x 60' | 35,000 | 5,000 | 40,000 |
| Equipment Storage Building 40' x 200' | 30,000 | 4,500 | 34,500 |
| Oil House and Fuel Equipment | 4,000 | 400 | 4,400 |
| Farm Supply Storage Building 30' x 40' | 6,000 | 600 | 6,600 |
| Utilities | 4,000 | 400 | 4,400 |
| TOTAL | 104,000 | 14,900 | 118,900 |
| <u>MANAGEMENT & OPERATIONAL REQUIREMENTS:</u> | | | |
| Conservation Education Building | 85,000 | 13,000 | 98,000 |
| Residence | 25,000 | 4,000 | 29,000 |
| TOTAL | 110,000 | 17,000 | 127,000 |
| | | | |
| Basic Development Requirements | 104,000 | 14,900 | 118,900 |
| Mgt. & Operational Requirements | 110,000 | 17,000 | 127,000 |
| GRAND TOTAL-Headquarter Facilities | 214,000 | 31,900 | 245,900 |

SUMMARY OF DEVELOPMENT COSTS

| | Basic Development Requirements | | | Management and Operational Requirements | | | COMPLETED UNIT COST |
|----------------------------|-----------------------------------|--------------|---------------|--|--------------|---------------|------------------------|
| | WORK COST | ENG. COST | TOTAL COST | WORK COST | ENG. COST | TOTAL COST | |
| Unit 1 | 180,020 | 26,910 | 206,930 | 69,340 | 2,700 | 72,040 | 278,970 |
| Unit 2 | 166,924 | 25,346 | 192,270 | 35,470 | 2,100 | 37,570 | 229,840 |
| Unit 3 | 177,400 | 26,650 | 204,050 | 43,450 | 1,880 | 45,330 | 249,380 |
| Unit 4 | 233,780 | 35,020 | 268,800 | 33,500 | 3,300 | 36,850 | 305,650 |
| Unit 5 | 58,730 | 8,940 | 67,670 | 16,660 | 1,000 | 17,660 | 85,330 |
| Unit 6 | 240,314 | 35,166 | 275,480 | 55,250 | 5,010 | 60,260 | 335,740 |
| Hdqtrs. Facili- ties | 104,000 | 14,900 | 118,900 | 110,000 | 17,000 | 127,000 | 245,900 |
| TOTAL | 1,161,168 | 172,932 | 1,334,100 | 363,670 | 32,990 | 396,710 | 1,730,810 |

DEVELOPMENT PROGRAM SCHEDULE

1st Year (F.Y. 1964)

| <u>BASIC DEVELOPMENT REQUIREMENTS:</u> | NO. UNITS | COST PER UNIT | WORK COST | ENG. COST | TOTAL COST |
|--|--------------|---------------------|--------------|--------------|---------------|
| <u>Unit 2</u> | | | | | |
| <u>Dike</u> | | | | | |
| Timber Clearing & Stripping | 1.6 mi. | 10,000 | 16,000 | 2,400 | 18,400 |
| Earthwork | 1.6 mi. | 38,000 | 60,800 | 9,200 | 70,000 |
| Equalizer | 1 ea. | 20,000 | 20,000 | 3,000 | 23,000 |
| Control Structure & Drain | 1 ea. | 15,000 | 15,000 | 2,300 | 17,300 |
| <u>Ditch (Pool Drainage)</u> | | | | | |
| Timber Clearing | 1.1 mi. | 2,000 | 2,200 | 300 | 2,500 |
| Earthwork excavation | 1.1 mi. | 7,500 | 8,250 | 1,250 | 9,500 |
| <u>Upland Ponds</u> | | | | | |
| C | 1 ea. | 5,000 | 5,000 | 800 | 5,800 |
| D | 1 ea. | 5,000 | 5,000 | 800 | 5,800 |
| E | 1 ea. | 6,500 | 6,500 | 1,000 | 7,500 |
| <u>Boundary Fence - 6,387'</u> | | | | | |
| Fence Construction | 1.2 mi. | 900 | 1,080 | 220 | 1,300 |
| Boundary Posting | 3.1 mi. | 100 | 310 | -- | 310 |
| TOTAL | | | 140,140 | 21,270 | 161,410 |

MANAGEMENT & OPERATIONAL REQUIREMENTS:

| | | | | | |
|----------------|--------|-----|-----|----|-----|
| <u>Unit 1</u> | | | | | |
| Timber Screens | .6 mi. | 600 | 360 | -- | 360 |
| TOTAL | | | 360 | -- | 360 |

GRAND TOTAL - 1st Year 140,500 21,270 161,770

DEVELOPMENT PROGRAM SCHEDULE

2nd Year (F.Y. 1965)

| | NO. | COST | WORK | ENG. | TOTAL |
|---|---------|----------|---------|--------|---------|
| BASIC DEVELOPMENT REQUIREMENTS: | UNITS | PER UNIT | COST | COST | COST |
| <u>Unit 2</u> | | | | | |
| Pump (Cost shared w/Units 3 & 4) | 1 ea. | 20,000 | 8,000 | 1,200 | 9,200 |
| Road (surfaced) | 2.8 mi. | 5,280 | 14,784 | 2,216 | 17,000 |
| Clearing in Pool Areas, Adj. Cropland | | | | | |
| Timber slashing | 20 ac. | 200 | 4,000 | 660 | 4,660 |
| <u>Unit 3</u> | | | | | |
| Dike | | | | | |
| Timber Clearing & Stripping | 1.6 mi. | 10,000 | 16,000 | 2,400 | 18,400 |
| Water Supply Structure (from Unit 2) | 1 ea. | 7,000 | 7,000 | 1,000 | 8,000 |
| Equalizer | 1 ea. | 20,000 | 20,000 | 3,000 | 23,000 |
| Control Structure & Drain | 1 ea. | 15,000 | 15,000 | 2,300 | 17,300 |
| Ditch (Pool Drainage) | | | | | |
| Timber Clearing | 1 mi. | 2,000 | 2,000 | 300 | 2,300 |
| Earthwork excavation | 1 mi. | 7,500 | 7,500 | 1,100 | 8,600 |
| Pump (Cost shared w/Units 2 & 4) | 1 ea. | 20,000 | 6,000 | 900 | 6,900 |
| Boundary Fence | | | | | |
| Hedgerow Clearing | 1.3 mi. | 400 | 520 | 80 | 600 |
| Fence Construction | 1.7 mi. | 900 | 1,530 | 270 | 1,800 |
| Boundary Posting | 2.5 mi. | 100 | 250 | -- | 250 |
| <u>Unit 4</u> | | | | | |
| Ditch (Pool Drainage) | | | | | |
| Timber Clearing | 3.1 mi. | 2,000 | 6,200 | 900 | 7,100 |
| Earthwork excavation | 3.1 mi. | 7,500 | 23,250 | 3,450 | 26,700 |
| Pump (Cost shared with Units 2 & 3) | 1 ea. | 20,000 | 6,000 | 900 | 6,900 |
| TOTAL | | | 138,034 | 20,676 | 158,710 |
| <u>MANAGEMENT & OPERATIONAL REQUIREMENTS:</u> | | | | | |
| <u>Unit 2</u> | | | | | |
| Patrol Trails (Unsurfaced) | 1.2 mi. | 2,000 | 2,400 | 400 | 2,800 |
| Timber Screens | 1.7 mi. | 600 | 1,020 | -- | 1,020 |
| TOTAL | | | 3,420 | 400 | 3,820 |

GRAND TOTAL - 2nd Year

141,454 21,076 162,530

DEVELOPMENT PROGRAM SCHEDULE

3rd Year (F.Y. 1966)

| | | NO. | COST | WORK | ENG. | TOTAL |
|--|---|---------|----------|---------|--------|---------|
| | | UNITS | PER UNIT | COST | COST | COST |
| <u>BASIC DEVELOPMENT REQUIREMENTS:</u> | | | | | | |
| <u>Unit 3</u> | | | | | | |
| Dike | | | | | | |
| Earthwork | | 1 mi. | 35,000 | 35,000 | 5,000 | 40,000 |
| Upland Ponds | F | 1 ea. | 5,500 | 5,500 | 800 | 6,300 |
| | G | 1 ea. | 6,000 | 6,000 | 900 | 6,900 |
| <u>Unit 4</u> | | | | | | |
| Dike | | | | | | |
| Timber Clearing & Stripping | | 1.9 mi. | 10,000 | 19,000 | 2,800 | 21,800 |
| Water Supply Structure (from Unit 3) | | 1 ea. | 7,000 | 7,000 | 1,000 | 8,000 |
| <u>Unit 5</u> | | | | | | |
| Dike | | | | | | |
| Timber Clearing & Stripping | | .4 mi. | 10,000 | 4,000 | 600 | 4,600 |
| <u>Unit 6</u> | | | | | | |
| Ditch (Pool Drainage) | | | | | | |
| Timber Clearing | | 2 mi. | 2,000 | 4,000 | 600 | 4,600 |
| <u>Headquarter Facilities</u> | | | | | | |
| Equipment Storage Building 40' x 200' | | | | 30,000 | 4,500 | 34,500 |
| TOTAL | | | | 110,500 | 16,200 | 126,700 |
| <u>MANAGEMENT & OPERATIONAL REQUIREMENTS:</u> | | | | | | |
| <u>Unit 2</u> | | | | | | |
| Cropland Development | | | | | | |
| Brush and Hedgerow Clearing | | 15 ac. | 150 | 2,250 | -- | 2,250 |
| Soil and Moisture Practices | | 286 ac. | 50 | 14,300 | -- | 14,300 |
| Grassland Development | | | | | | |
| Brush & Timber Clearing | | 20 ac. | 100 | 2,000 | -- | 2,000 |
| Soil and Moisture Practices | | 50 ac. | 50 | 2,500 | -- | 2,500 |
| Nesting Islands | | 4 ea. | 2,000 | 8,000 | 1,200 | 9,200 |
| Recreational Development | | | | | | |
| Nature Trail & Parking Area (Parking Area also serves Trail to Sour Springs on Unit 3) | | 1 ea. | 3,000 | 3,000 | 500 | 3,500 |
| <u>Unit 3</u> | | | | | | |
| Patrol Trails (Unsurfaced) | | .6 mi. | 2,000 | 1,200 | 180 | 1,380 |
| TOTAL | | | | 33,250 | 1,880 | 35,130 |

GRAND TOTAL - 3rd Year

143,750 18,080 161,830

DEVELOPMENT PROGRAM SCHEDULE

4th Year (F.Y. 1967)

| | | NO. | COST | WORK | ENG. | TOTAL |
|---|---|----------|--------|---------|--------|---------|
| | | UNITS | PER | COST | COST | COST |
| | | UNIT | | | | |
| <u>BASIC DEVELOPMENT REQUIREMENTS:</u> | | | | | | |
| <u>Unit 3</u> | | | | | | |
| <u>Dike</u> | | | | | | |
| Earthwork | | 1 mi. | 35,000 | 35,000 | 5,500 | 40,500 |
| Upland Ponds | H | 1 ea. | 4,500 | 4,500 | 700 | 5,200 |
| | I | 1 ea. | 4,500 | 4,500 | 700 | 5,200 |
| | J | 1 ea. | 4,500 | 4,500 | 700 | 5,200 |
| Road (surfaced) | | 1.25 mi. | 5,280 | 6,600 | 1,000 | 7,600 |
| <u>Unit 4</u> | | | | | | |
| <u>Dike</u> | | | | | | |
| Earthwork | | .95 mi. | 35,000 | 33,250 | 5,000 | 38,250 |
| Boundary Fence | | | | | | |
| Hedgerow Clearing | | 1.1 mi. | 400 | 440 | 60 | 500 |
| Fence Construction | | 2.1 mi. | 900 | 1,890 | 310 | 2,200 |
| Boundary Posting | | 3 mi. | 100 | 300 | -- | 300 |
| <u>Unit 5</u> | | | | | | |
| <u>Dike</u> | | | | | | |
| Earthwork | | .65 mi. | 35,000 | 22,750 | 3,450 | 26,200 |
| Water Supply Structure (from Unit 4) | | 1 ea. | 7,000 | 7,000 | 1,000 | 8,000 |
| Control Structure & Drain | | 1 ea. | 15,000 | 15,000 | 2,300 | 17,300 |
| TOTAL | | | | 135,730 | 20,720 | 156,450 |
| <u>MANAGEMENT & OPERATIONAL REQUIREMENTS:</u> | | | | | | |
| <u>Unit 3</u> | | | | | | |
| <u>Grassland Development</u> | | | | | | |
| Interior Fencing (Grazing Mgt.) | | 5.1 mi. | 900 | 4,590 | -- | 4,590 |
| Pothole Development | | 10 ea. | 300 | 3,000 | 500 | 3,500 |
| Timber Screens | | .6 mi. | 600 | 360 | -- | 360 |
| Upland Wildlife Development | | 60 ac. | 80 | 4,800 | -- | 4,800 |
| <u>Unit 4</u> | | | | | | |
| <u>Patrol Trails (Unsurfaced)</u> | | | | | | |
| | | .4 mi. | 2,000 | 800 | 120 | 920 |
| TOTAL | | | | 13,550 | 620 | 14,170 |
| GRAND TOTAL - 4th Year | | | | 149,280 | 21,340 | 170,620 |

DEVELOPMENT PROGRAM SCHEDULE

5th Year (F.Y. 1968)

| | NO. | COST | WORK | ENG. | TOTAL |
|---|--------------|-----------------|----------------|---------------|----------------|
| <u>BASIC DEVELOPMENT REQUIREMENTS:</u> | <u>UNITS</u> | <u>PER UNIT</u> | <u>COST</u> | <u>COST</u> | <u>COST</u> |
| <u>Unit 4</u> | | | | | |
| Dike | | | | | |
| Earthwork | .95 mi. | 35,000 | 33,250 | 5,000 | 38,250 |
| Equalizer | 2 ea. | 20,000 | 40,000 | 6,000 | 46,000 |
| Control Structure & Drain | 1 ea. | 15,000 | 15,000 | 2,300 | 17,300 |
| Drain, Cost of double dike, Units 5 and 6 | 1 mi. | 35,000 | 35,000 | 5,300 | 40,300 |
| <u>Unit 5</u> | | | | | |
| Road (surfaced) | .5 mi. | 5,280 | 2,640 | 410 | 3,050 |
| Boundary Fence | | | | | |
| Hedgerow Clearing | .6 mi. | 400 | 240 | 40 | 280 |
| Fence Construction | 1 mi. | 900 | 900 | 140 | 1,040 |
| Boundary Posting | 2 mi. | 100 | 200 | -- | 200 |
| <u>Headquarter Facilities</u> | | | | | |
| Farm Supply Storage Building 30' x 40' | | | 6,000 | 600 | 6,600 |
| <u>TOTAL</u> | | | <u>133,230</u> | <u>19,790</u> | <u>153,020</u> |
| <u>MANAGEMENT & OPERATIONAL REQUIREMENTS:</u> | | | | | |
| <u>Unit 4</u> | | | | | |
| Grassland Development | | | | | |
| Brush & Timber Clearing | 22 ac. | 100 | 2,200 | -- | 2,200 |
| Soil and Moisture Practices | 75 ac. | 50 | 3,750 | -- | 3,750 |
| Pothole Development | 4 ea. | 300 | 1,200 | 180 | 1,380 |
| <u>TOTAL</u> | | | <u>7,150</u> | <u>180</u> | <u>7,330</u> |
| GRAND TOTAL - 5th Year | | | 140,380 | 19,970 | 160,350 |

DEVELOPMENT PROGRAM SCHEDULE

6th Year (F.Y. 1969)

| <u>BASIC DEVELOPMENT REQUIREMENTS:</u> | NO. UNITS | COST PER UNIT | WORK COST | ENG. COST | TOTAL COST |
|--|--------------|---------------------|----------------|---------------|----------------|
| <u>Unit 4</u> | | | | | |
| Drain, Cost of double dike, | | | | | |
| Road, on dike | 1 mi. | 5,280 | 5,280 | 820 | 6,100 |
| Road, (surfaced) | 1.5 mi. | 5,280 | 7,920 | 1,180 | 9,100 |
| <u>Unit 5</u> | | | | | |
| Clearing in Pool Areas, Adj. cropland | | | | | |
| Brush Clearing | 20 ac. | 100 | 2,000 | 400 | 2,400 |
| Timber slashing | 20 ac. | 200 | 4,000 | 600 | 4,600 |
| <u>Unit 6</u> | | | | | |
| <u>Dike</u> | | | | | |
| Earthwork | 1.15 mi. | 30,000 | 35,000 | 5,000 | 40,000 |
| Timber Clearing & Stripping | 1 mi. | 10,000 | 10,000 | 1,500 | 11,500 |
| Water Supply Structure (from Unit 4) | 1 ea. | 7,000 | 7,000 | 1,000 | 8,000 |
| Ditch (Pool Drainage) | | | | | |
| Earthwork excavation | 2.9 mi. | 7,500 | 21,750 | 3,250 | 25,000 |
| <u>Headquarter Facilities</u> | | | | | |
| Office 26' x 36' | | | 25,000 | 4,000 | 29,000 |
| Utilities | | | 4,000 | 400 | 4,400 |
| TOTAL | | | 121,950 | 18,150 | 140,100 |

MANAGEMENT & OPERATIONAL REQUIREMENTS:

| | | | | | |
|-------------------------------------|---------|-------|---------------|------------|---------------|
| <u>Unit 3</u> | | | | | |
| Grassland Development | | | | | |
| Brush & Timber Clearing | 100 ac. | 100 | 10,000 | -- | 10,000 |
| Recreational Development | | | | | |
| Trail, Sour Springs Historical Site | 1 ea. | 1,500 | 1,500 | -- | 1,500 |
| Parking Area-Overlook Goose | | | | | |
| Conc. Site | 1 ea. | 2,000 | 2,000 | 300 | 2,300 |
| <u>Unit 4</u> | | | | | |
| Upland Wildlife Development | 70 ac. | 80 | 5,600 | -- | 5,600 |
| <u>Unit 5</u> | | | | | |
| Patrol Trails (Unsurfaced) | .25 mi. | 2,000 | 500 | 100 | 600 |
| Cropland Development | | | | | |
| Brush and Hedgerow Clearing | 25 ac. | 100 | 2,500 | -- | 2,500 |
| Grassland Development | | | | | |
| Interior Fencing (Grazing Mgt.) | 2.4 mi. | 900 | 2,160 | -- | 2,160 |
| TOTAL | | | 24,260 | 400 | 24,660 |

GRAND TOTAL - 6th Year

140,100 24,660 164,760

DEVELOPMENT PROGRAM SCHEDULE

7th Year (F.Y. 1970)

| <u>BASIC DEVELOPMENT REQUIREMENTS:</u> | <u>NO. UNITS</u> | <u>COST PER UNIT</u> | <u>WORK COST</u> | <u>ENG. COST</u> | <u>TOTAL COST</u> |
|---|----------------------|------------------------------|----------------------|----------------------|-----------------------|
| <u>Unit 1</u> | | | | | |
| <u>Upland Ponds</u> | | | | | |
| A | 1 ea. | 6,000 | 6,000 | 900 | 6,900 |
| <u>Unit 6</u> | | | | | |
| <u>Dike</u> | | | | | |
| Earthwork | 1.35 mi. | 30,000 | 40,000 | 6,000 | 46,000 |
| Inverted Syphon (Unit 5-6) | 1 ea. | 13,000 | 13,000 | 2,000 | 15,000 |
| Equalizer | 1 ea. | 20,000 | 20,000 | 3,000 | 23,000 |
| Control Structure & Drain | 2 ea. | 15,000 | 30,000 | 4,500 | 34,500 |
| Boundary Fence | | | | | |
| Hedgerow Clearing | 2.4 mi. | 400 | 960 | 140 | 1,100 |
| Fence Construction | 4.1 mi. | 900 | 3,690 | 560 | 4,250 |
| Boundary Posting | 6.3 mi. | 100 | 630 | -- | 630 |
| <u>Headquarter Facilities</u> | | | | | |
| Oil House and Fuel Equipment | | | 4,000 | 400 | 4,400 |
| <u>TOTAL</u> | | | <u>118,280</u> | <u>17,500</u> | <u>135,780</u> |
| <u>MANAGEMENT & OPERATIONAL REQUIREMENTS:</u> | | | | | |
| <u>Unit 3</u> | | | | | |
| <u>Grassland Development</u> | | | | | |
| Soil and Moisture Practices | 200 ac. | 50 | 10,000 | -- | 10,000 |
| <u>Unit 4</u> | | | | | |
| <u>Recreational Development</u> | | | | | |
| Picnic Facilities at Refuge Hdqtrs. | 1 ea. | 2,000 | 2,000 | 300 | 2,300 |
| <u>Unit 5</u> | | | | | |
| <u>Cropland Development</u> | | | | | |
| Soil and Moisture Practices | 50 ac. | 50 | 2,500 | -- | 2,500 |
| <u>Grassland Development</u> | | | | | |
| Soil and Moisture Practices | 60 ac. | 50 | 3,000 | -- | 3,000 |
| <u>Unit 6</u> | | | | | |
| <u>Patrol Trails (Unsurfaced)</u> | 4 mi. | 2,000 | 8,000 | 600 | 8,600 |
| <u>TOTAL</u> | | | <u>25,500</u> | <u>900</u> | <u>26,400</u> |
| GRAND TOTAL - 7th Year | | | 143,780 | 18,400 | 162,180 |

DEVELOPMENT PROGRAM SCHEDULE

8th Year (F.Y. 1971)

| <u>BASIC DEVELOPMENT REQUIREMENTS:</u> | NO. UNITS | COST PER UNIT | WORK COST | ENG. COST | TOTAL COST |
|---|--------------|---------------------|--------------|--------------|---------------|
| <u>Unit 1</u> | | | | | |
| Dike | | | | | |
| Timber Clearing & Stripping | 2 mi. | 10,000 | 20,000 | 3,000 | 23,000 |
| Upland Ponds | | | | | |
| B | 1 ea. | 5,500 | 5,500 | 800 | 6,300 |
| Boundary Fence | | | | | |
| Hedgerow Clearing | 2.5 mi. | 400 | 1,000 | 100 | 1,100 |
| Fence Construction | 2.5 mi. | 900 | 2,250 | 350 | 2,600 |
| Boundary Posting | 4.3 mi. | 100 | 430 | -- | 430 |
| <u>Unit 6</u> | | | | | |
| Road (surfaced) | 2.8 mi. | 5,280 | 14,784 | 2,116 | 16,900 |
| Clearing in Pool Areas | | | | | |
| Brush Clearing | 115 ac. | 150 | 17,500 | 2,500 | 20,000 |
| Timber slashing | 10 ac. | 200 | 2,000 | -- | 2,000 |
| <u>Headquarter Facilities</u> | | | | | |
| Shop and Garage 30' x 60' | | | 35,000 | 5,000 | 40,000 |
| <u>TOTAL</u> | | | 98,464 | 13,866 | 112,330 |
| <u>MANAGEMENT & OPERATIONAL REQUIREMENTS:</u> | | | | | |
| <u>Unit 1</u> | | | | | |
| Grassland Development | | | | | |
| Interior Fencing (Grazing Mgt.) | 3 mi. | 900 | 2,700 | -- | 2,700 |
| Pothole Development | 3 ea. | 300 | 900 | 100 | 1,000 |
| Upland Wildlife Development | 90 ac. | 80 | 7,200 | -- | 7,200 |
| <u>Unit 3</u> | | | | | |
| Nesting Islands | 3 ea. | 2,000 | 6,000 | 900 | 6,900 |
| <u>Unit 4</u> | | | | | |
| Nesting Islands | 4 ea. | 1,500 | | | |
| | 6 ea. | 2,000 | 18,000 | 2,700 | 20,700 |
| <u>Unit 5</u> | | | | | |
| Nesting Islands | 4 ea. | 1,500 | 6,000 | 900 | 6,900 |
| <u>Unit 6</u> | | | | | |
| Cropland Development | | | | | |
| Brush and Hedgerow Clearing | 4 ac. | 100 | 400 | -- | 400 |
| Timber Screens | .75 mi. | 600 | 450 | 70 | 520 |
| Recreational Development | | | | | |
| Parking Area - Waterfowl Overlook | 1 ea. | 2,500 | 2,500 | 370 | 2,870 |
| Observation Tower | 1 ea. | 2,500 | 2,500 | 370 | 2,870 |
| <u>TOTAL</u> | | | 46,650 | 5,410 | 52,060 |
| GRAND TOTAL - 8th Year | | | 145,114 | 19,276 | 164,390 |

DEVELOPMENT PROGRAM SCHEDULE

9th Year (F.Y. 1972)

| | NO. UNITS | COST PER UNIT | WORK COST | ENG. COST | TOTAL COST |
|---|--------------|---------------------|--------------|--------------|---------------|
| <u>BASIC DEVELOPMENT REQUIREMENTS:</u> | | | | | |
| <u>Unit 1</u> | | | | | |
| Dike | | | | | |
| Earthwork | 1 mi. | 35,000 | 35,000 | 5,000 | 40,000 |
| Equalizer | 1 ea. | 20,000 | 20,000 | 3,000 | 23,000 |
| <u>Unit 6</u> | | | | | |
| Clearing in Pool Areas | | | | | |
| Brush Clearing | 135 ac. | 150 | 20,000 | 3,000 | 23,000 |
| TOTAL | | | 75,000 | 11,000 | 86,000 |
| <u>MANAGEMENT & OPERATIONAL REQUIREMENTS:</u> | | | | | |
| <u>Unit 1</u> | | | | | |
| Patrol Trails (Unsurfaced) | 1.75 mi. | 2,000 | 3,500 | 500 | 4,000 |
| Grassland Development | | | | | |
| Brush & Timber Clearing | 50 ac. | 100 | 5,000 | -- | 5,000 |
| <u>Unit 6</u> | | | | | |
| Cropland Development | | | | | |
| Soil and Moisture Practices | 60 ac. | 40 | 2,400 | -- | 2,400 |
| Grassland Development | | | | | |
| Brush & Timber Clearing | 100 ac. | 100 | 10,000 | -- | 10,000 |
| Nesting Islands | 8 ea. | 1,500 | | | |
| | 6 ea. | 2,000 | 24,000 | 3,600 | 27,600 |
| <u>Headquarter Facilities</u> | | | | | |
| Residence | | | 25,000 | 4,000 | 29,000 |
| TOTAL | | | 69,900 | 8,100 | 78,000 |
| GRAND TOTAL - 9th Year | | | 144,900 | 19,100 | 164,000 |

DEVELOPMENT PROGRAM SCHEDULE

10th Year (F.Y. 1973)

| <u>BASIC DEVELOPMENT REQUIREMENTS:</u> | NO. UNITS | COST | | ENG. COST | TOTAL COST |
|---|--------------|-------------|--------------|--------------|---------------|
| | | PER UNIT | WORK COST | | |
| <u>Unit 1</u> | | | | | |
| Dike | | | | | |
| Earthwork | 1 mi. | 35,000 | 35,000 | 5,500 | 40,500 |
| Control Structure & Drain | 1 ea. | 15,000 | 15,000 | 2,300 | 17,300 |
| Pump | 1 ea. | 20,000 | 20,000 | 3,000 | 23,000 |
| Road (surfaced) | 3 mi. | 5,280 | 15,840 | 2,360 | 18,200 |
| Clearing in Pool Areas, Adj. cropland Timber slashing | 20 ac. | 200 | 4,000 | 600 | 4,600 |
| TOTAL | | | 89,840 | 13,760 | 103,600 |

MANAGEMENT & OPERATIONAL
REQUIREMENTS:

| | | | | | |
|---|---------|-------|--------|-------|--------|
| <u>Unit 1</u> | | | | | |
| Cropland Development | | | | | |
| Brush and Hedgerow Clearing | 20 ac. | 100 | 2,000 | -- | 2,000 |
| Soil and Moisture Practices | 156 ac. | 30 | 4,680 | -- | 4,680 |
| Grassland Development | | | | | |
| Soil and Moisture Practices | 200 ac. | 50 | 10,000 | -- | 10,000 |
| Nesting Islands | 13 ea. | 2,000 | 26,000 | 1,000 | 27,000 |
| Recreational Development | | | | | |
| Nature Trail & Parking Area (Hardwood timber Area) | 1 ea. | 3,000 | 3,000 | 500 | 3,500 |
| Nature Trail & Parking Area (Swallow Hollow Area) | 1 ea. | 4,000 | 4,000 | 600 | 4,600 |

| | | | | | |
|-----------------------------|---------|----|--------|-------|--------|
| <u>Unit 6</u> | | | | | |
| Grassland Development | | | | | |
| Soil and Moisture Practices | 100 ac. | 50 | 5,000 | -- | 5,000 |
| TOTAL | | | 54,680 | 2,100 | 56,780 |

GRAND TOTAL - 10th Year 144,520 15,860 160,380

DEVELOPMENT PROGRAM SCHEDULE

11th Year (F.Y. 1974)

| MANAGEMENT & OPERATIONAL REQUIREMENTS: | NO. UNITS | COST PER UNIT | WORK COST | ENG. COST | TOTAL COST |
|---|--------------|---------------------|--------------|--------------|---------------|
| <u>Headquarter Facilities</u> | | | | | |
| Conservation Education Building | | | 85,000 | 13,000 | 98,000 |
| TOTAL | | | 85,000 | 13,000 | 98,000 |
| GRAND TOTAL - 11th Year | | | 85,000 | 13,000 | 98,000 |

NATIONAL WILDLIFE REFUGE

DEVELOPMENT CONCEPT FOR OAK ORCHARD N. W. REFUGE

Map #1 - Showing Proposed Water Management and Land Use Proposals

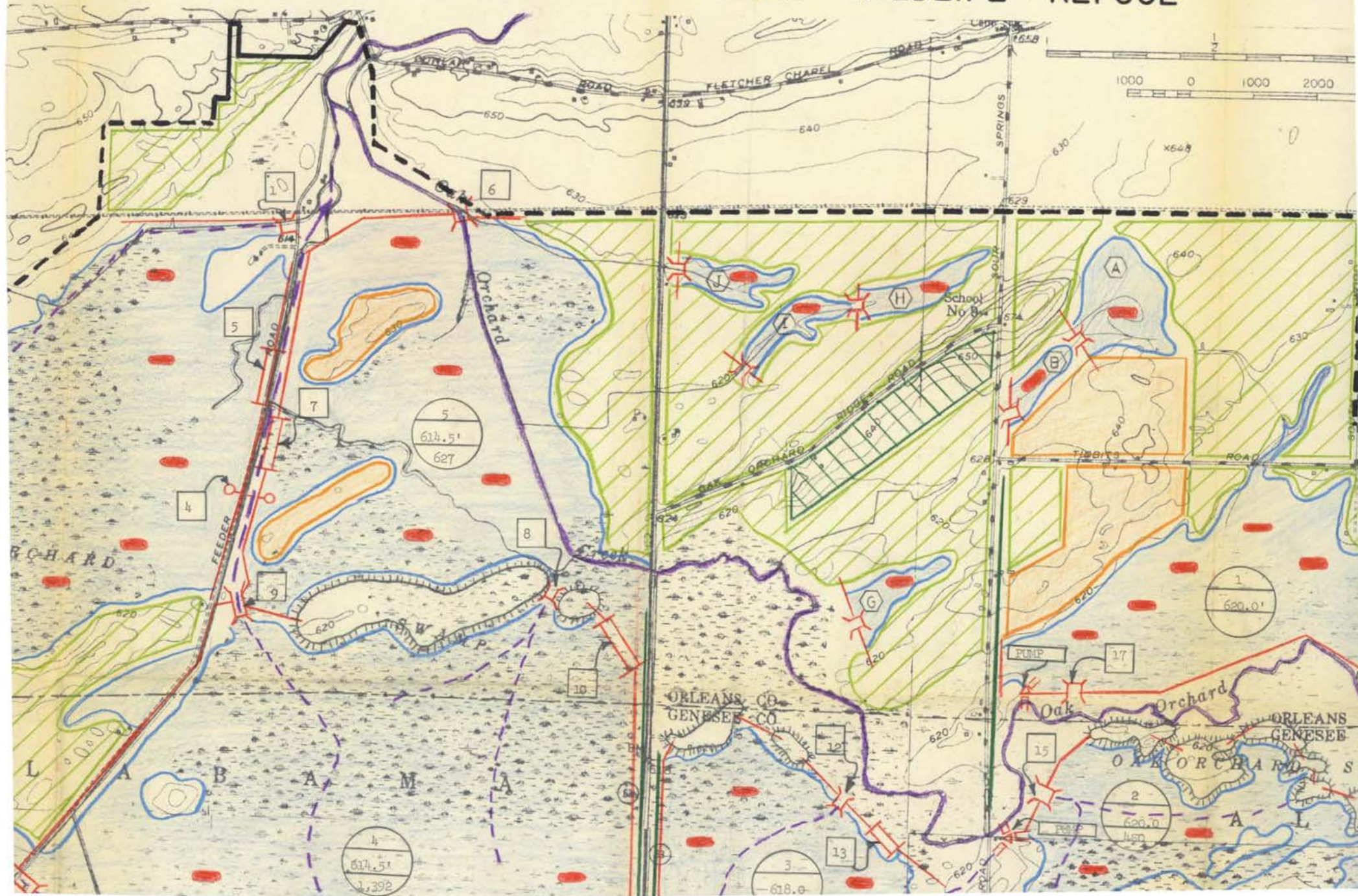
ACREAGES ESTIMATED FROM THIS MAP:

| | |
|--------------------------------------|-------------|
| CROPLAND AREA (Orange)..... | 547 Acres |
| GRASSLAND AREA (Green)..... | 2,427 Acres |
| UPLAND GAME HABITAT (Dark Green).... | 257 Acres |
| POOLS (Water Surface Area) | |
| Unit 1 (Criteria Designation) .. | 539 Acres |
| Unit 2 | 460 Acres |
| Unit 3 | 384 Acres |
| Unit 4 | 1,392 Acres |
| Unit 5 | 627 Acres |
| Unit 6 | 1,410 Acres |
| TOTAL | 4,812 Acres |

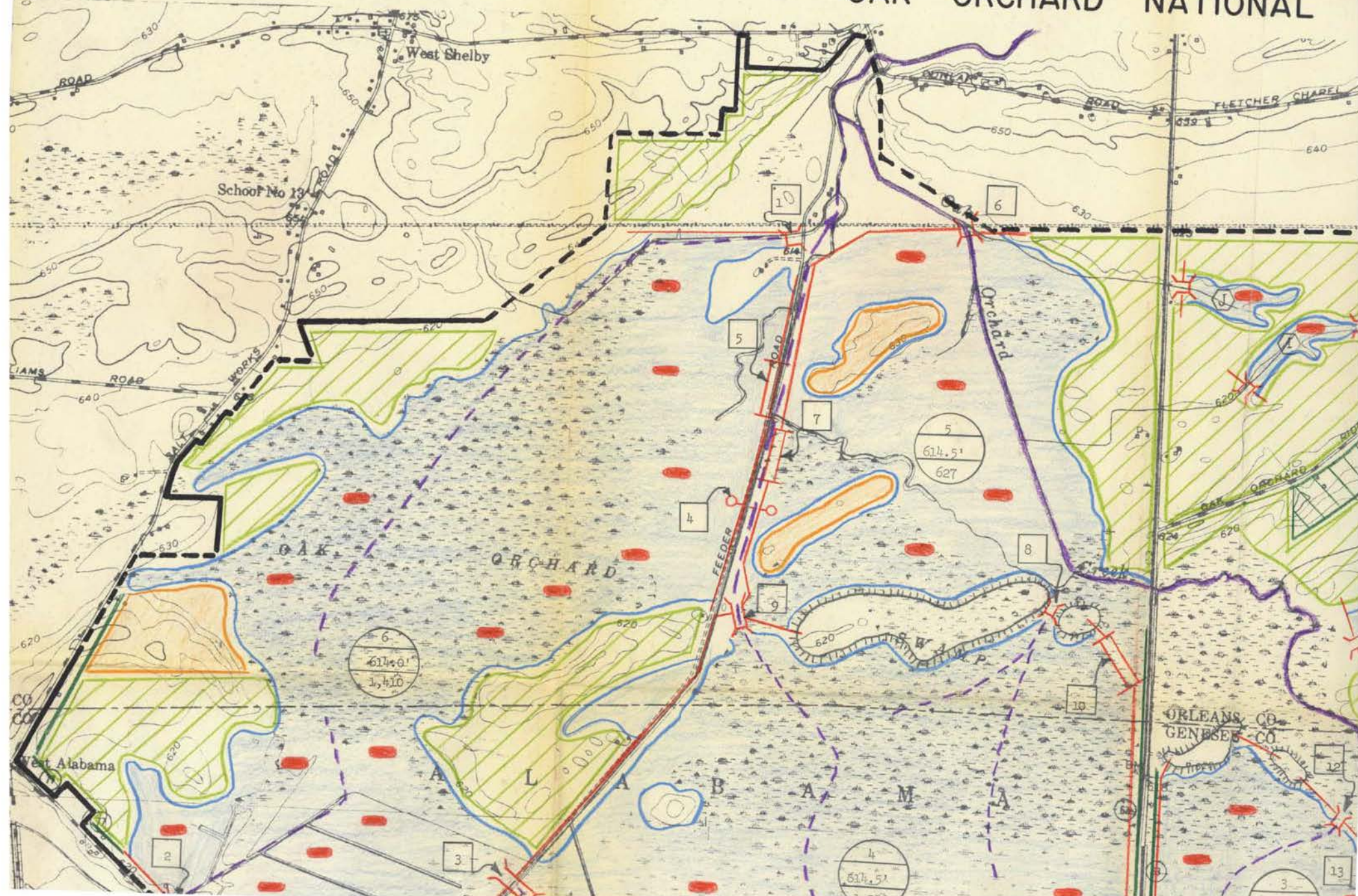
Map #1 - Showing Proposed Water Management and
Land Use Proposals

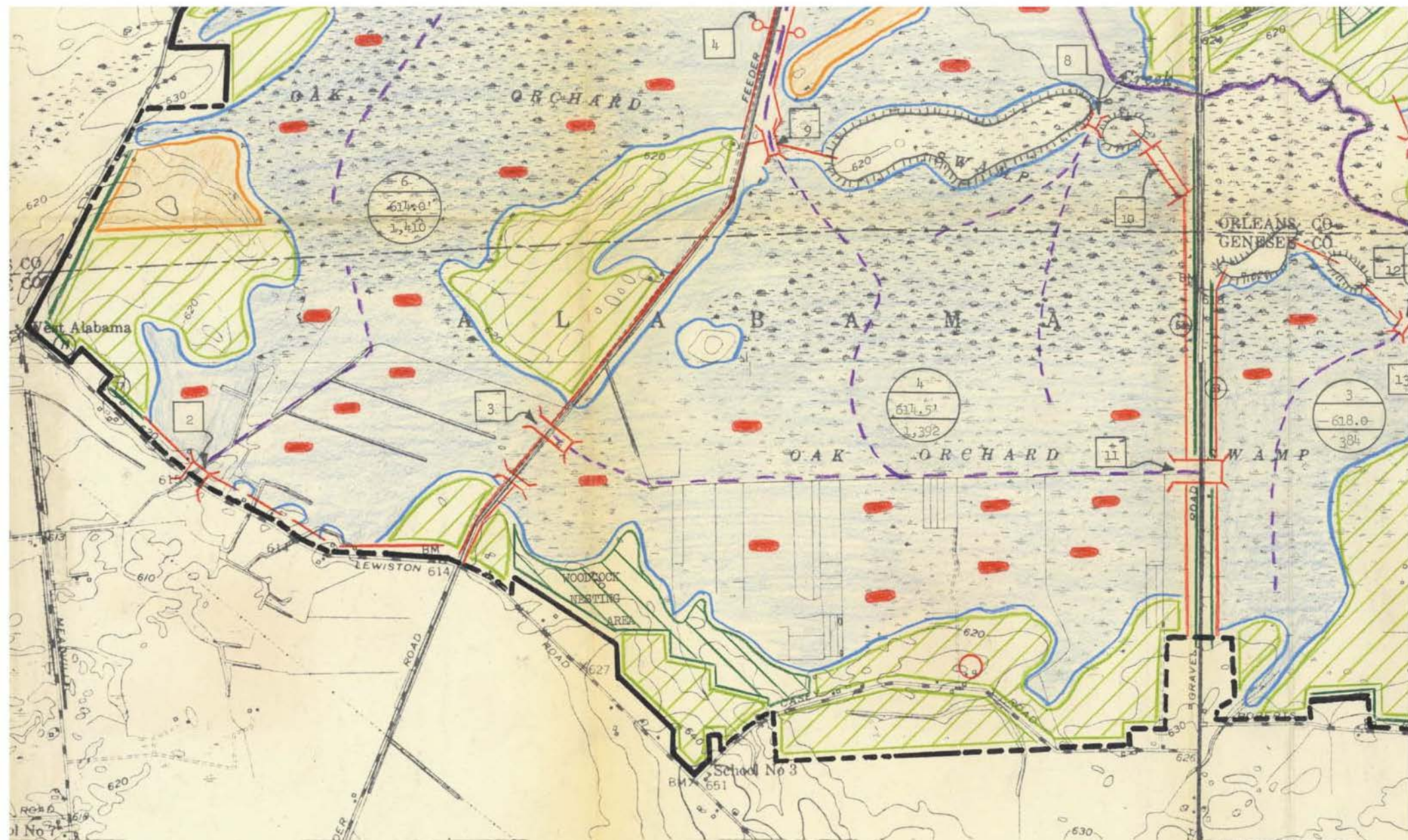
| | |
|--|-------------|
| CROPLAND AREA (Orange) | 547 Acres |
| GRASSLAND AREA (Green) | 2,427 Acres |
| UPLAND GAME HABITAT (Dark Green) | 257 Acres |
| POOLS (Water Surface Area) | |
| Unit 1 (Criteria Designation) | 539 Acres |
| Unit 2 | 460 Acres |
| Unit 3 | 384 Acres |
| Unit 4 | 1,392 Acres |
| Unit 5 | 627 Acres |
| Unit 6 | 1,410 Acres |
| <hr/> | |
| TOTAL | 4,812 Acres |

OAK ORCHARD NATIONAL WILDLIFE REFUGE

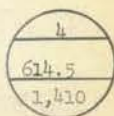


OAK ORCHARD NATIONAL

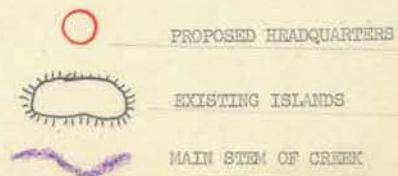


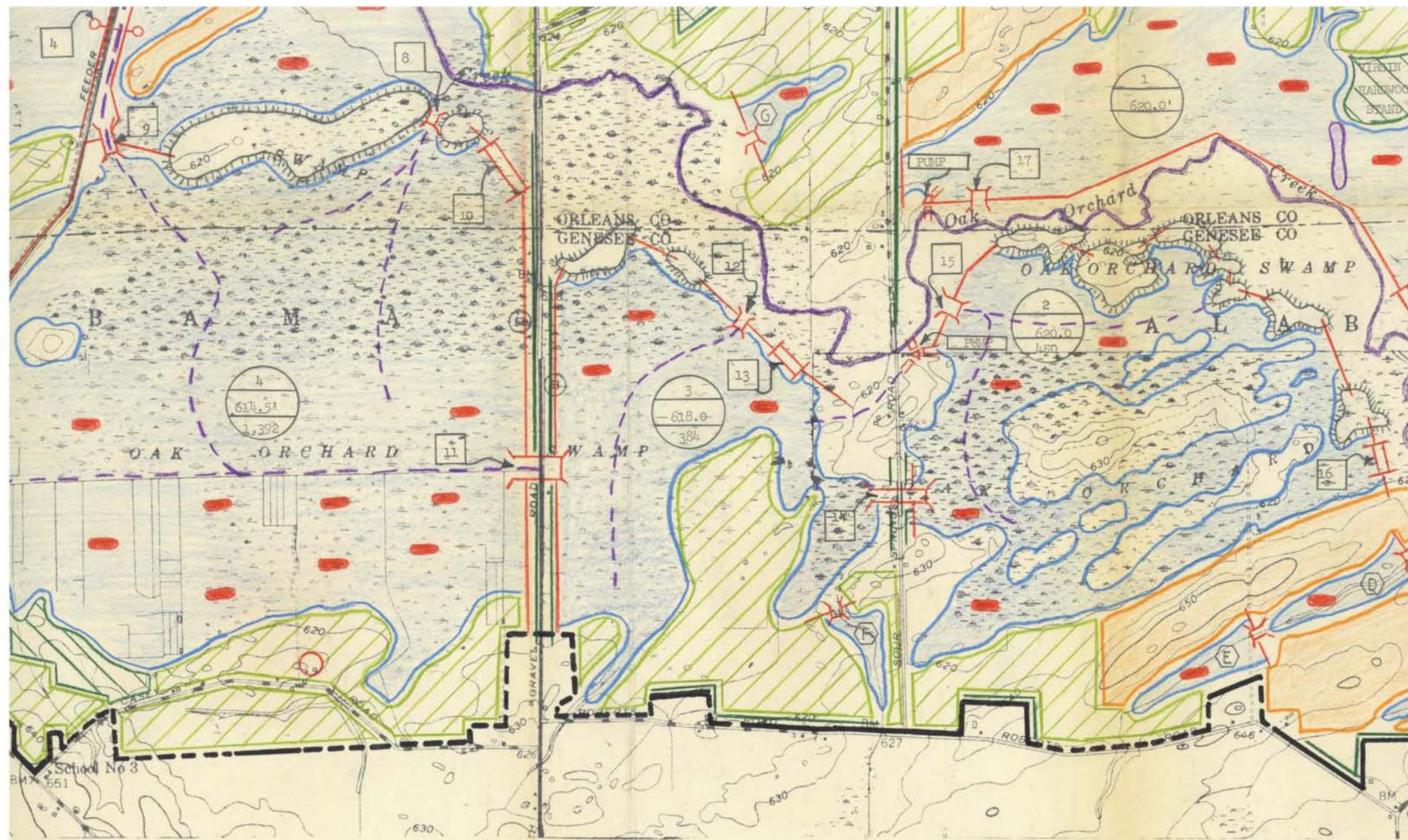


POOL UNITS


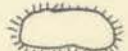






UNIT NUMBER
PROPOSED WATER SURFACE ELEV.
EST. SURFACE ACRES






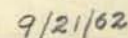


ER
WATER SURFACE ELEV.
ACE ACRES

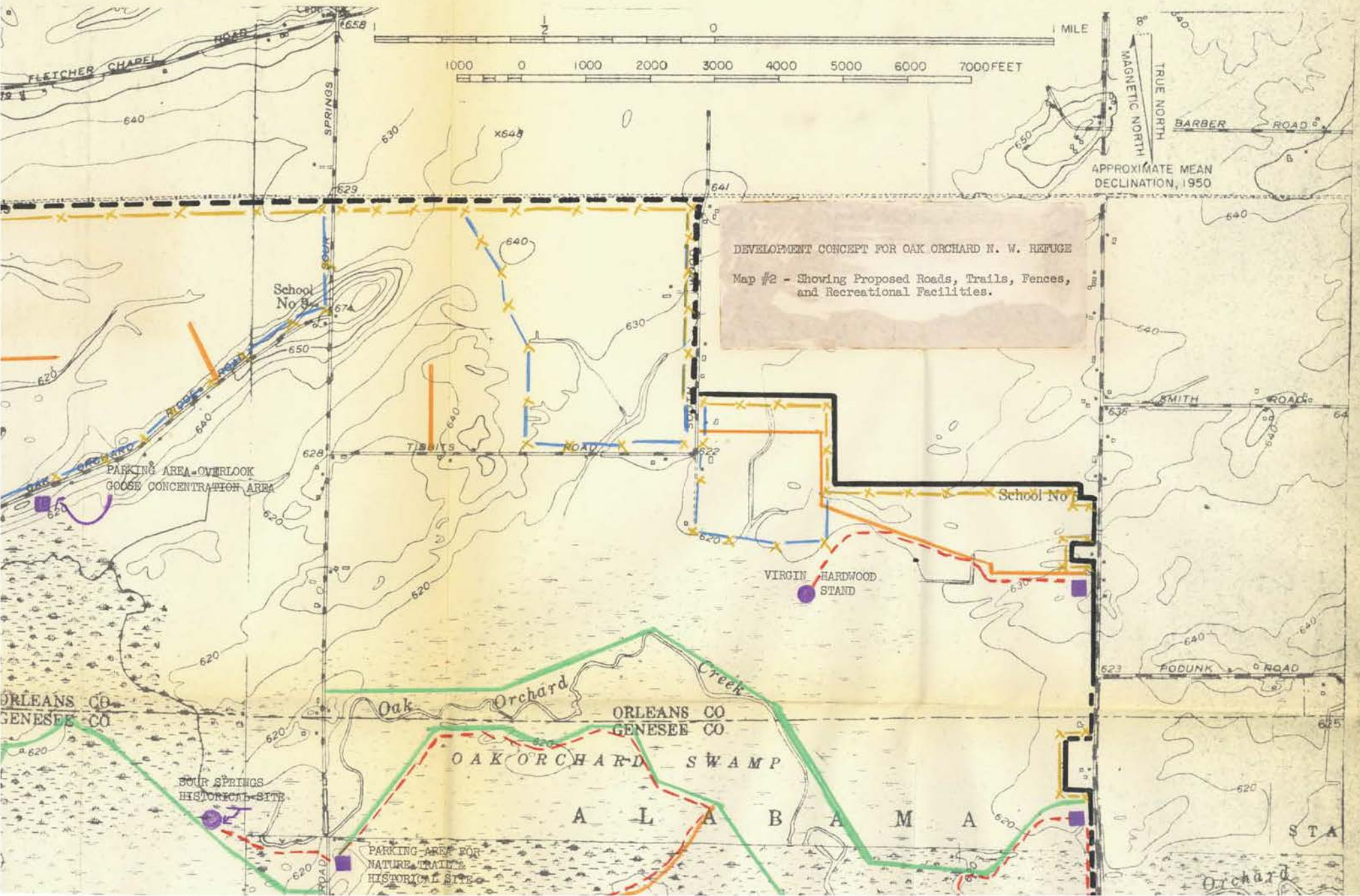
-  PROPOSED HEADQUARTERS
-  EXISTING ISLANDS
-  MAIN STEM OF CREEK

-  MANAGED PONDS AND POOLS
-  CROPLAND
-  GRASSLAND

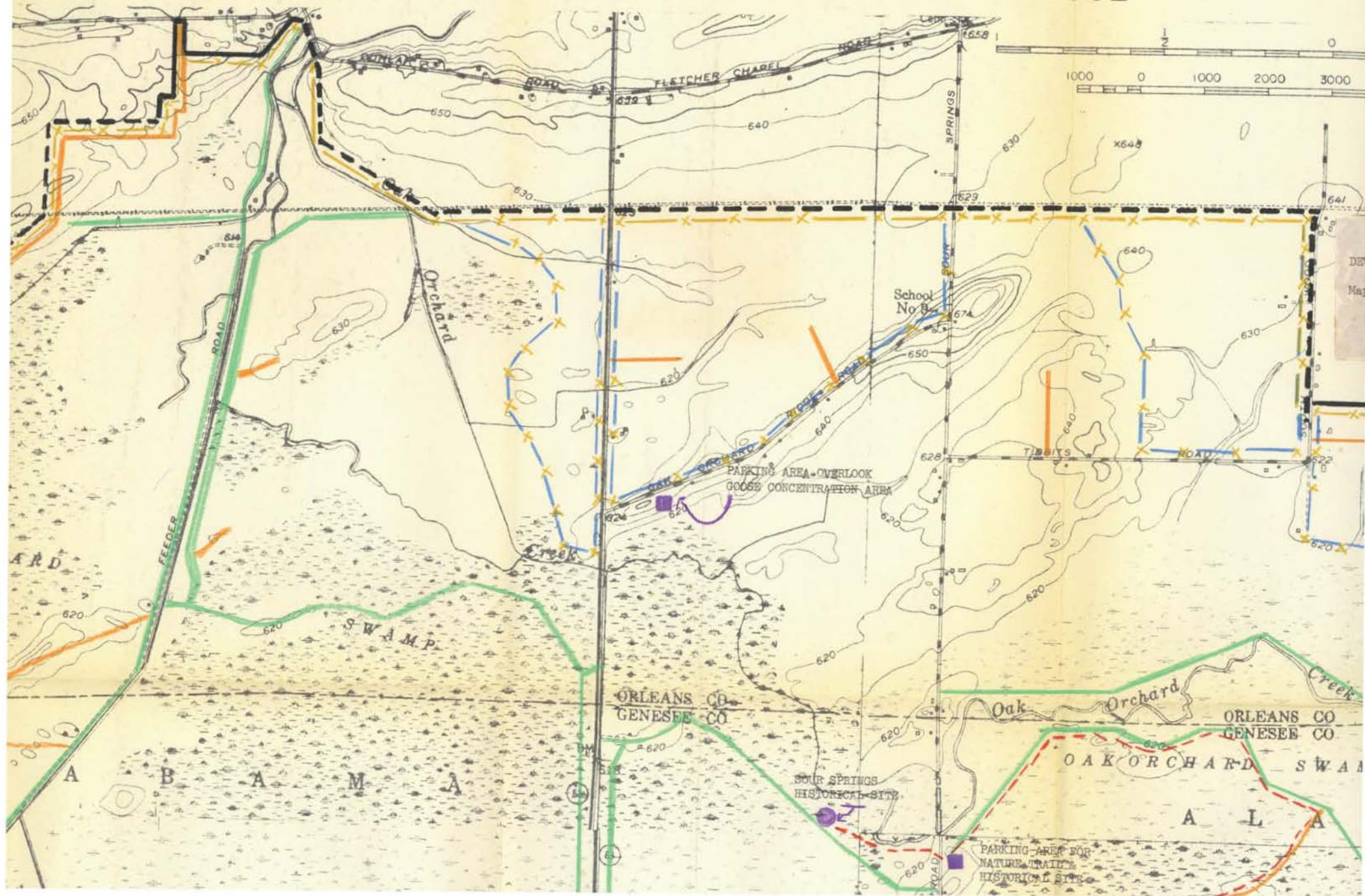
-  EXISTING PONDS
-  UPLAND GAME HABITAT
-  DRAINAGE DITCHES



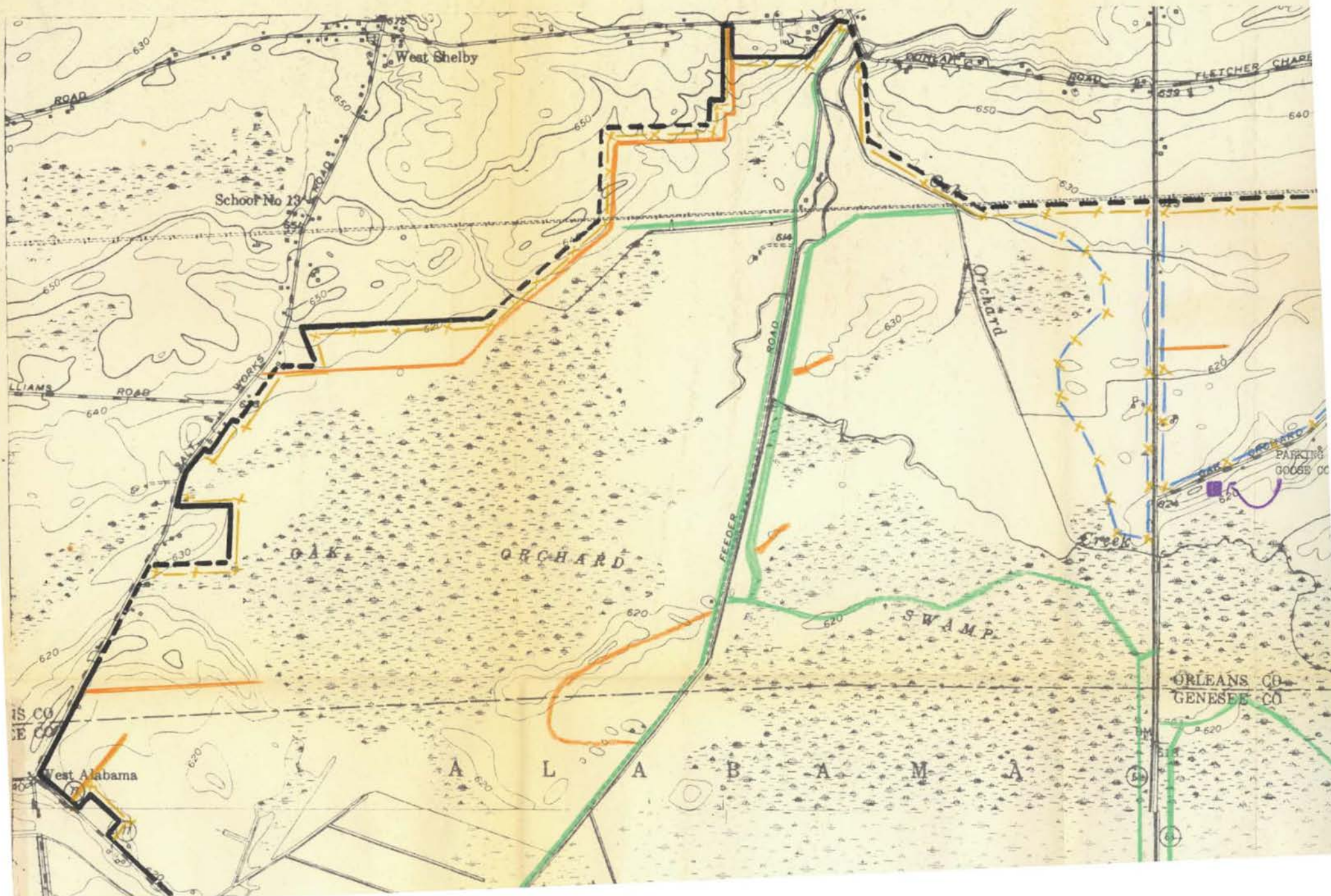
TIONAL WILDLIFE REFUGE

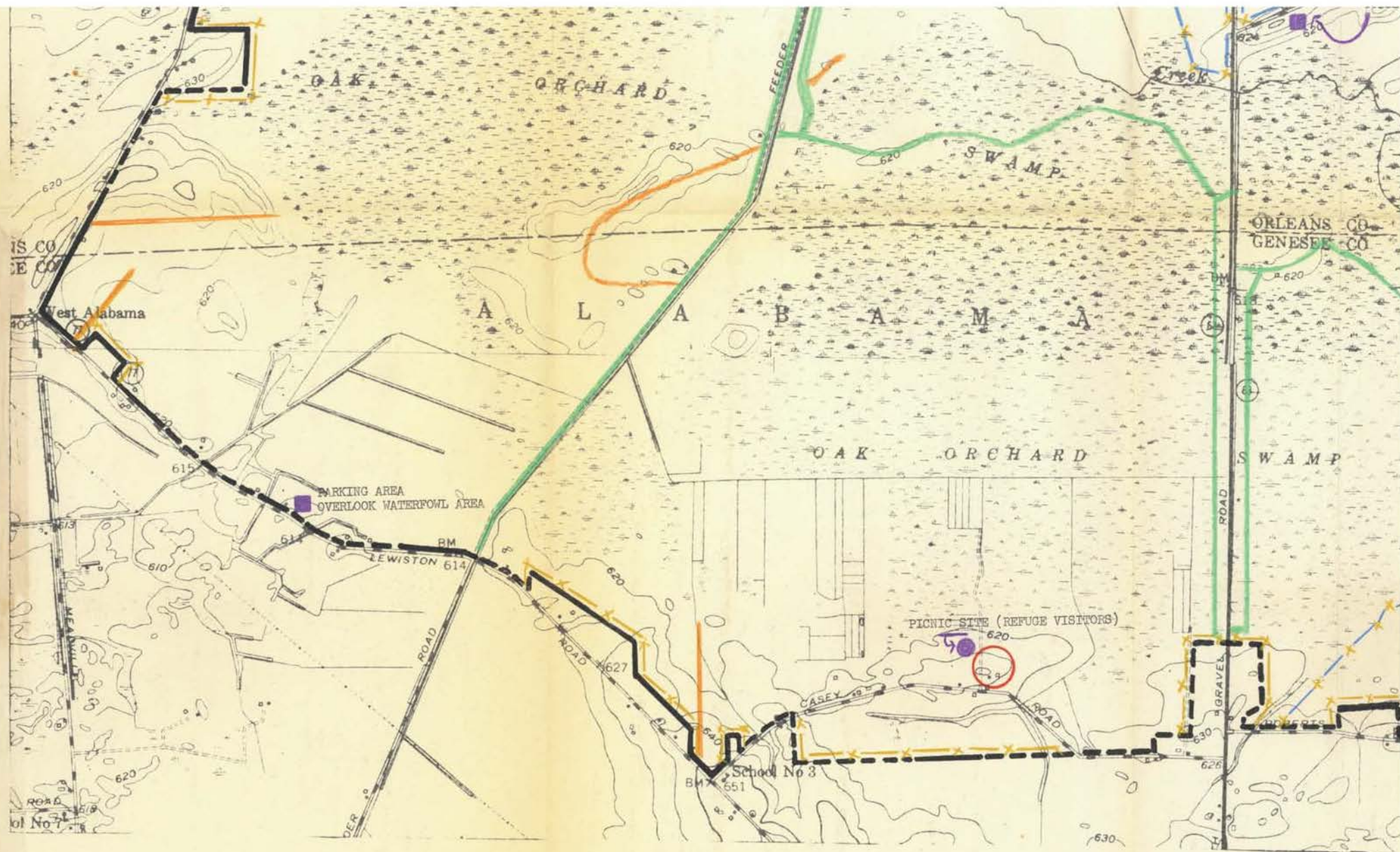


OAK ORCHARD NATIONAL WILDLIFE REFUGE



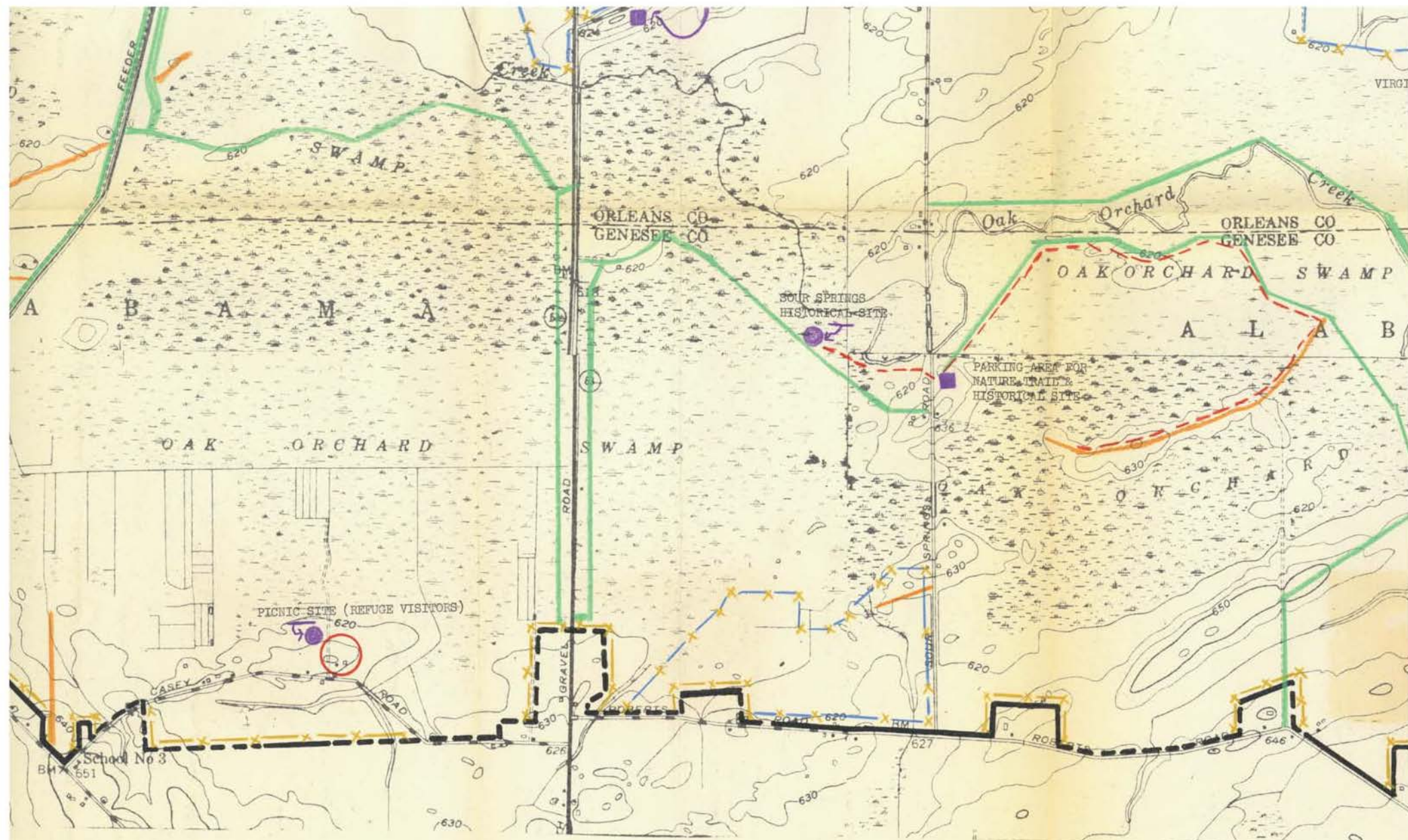
OAK ORCHARD NATIONAL



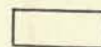


PROPOSED
HEADQUARTERS

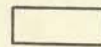




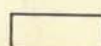
PROPOSED
HEADQUARTERS



BOUNDARY - Existing



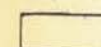
BOUNDARY - Proposed



FENCE - Boundary

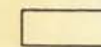


FENCE - Grazing Management



RECREATIONAL FACILITIES

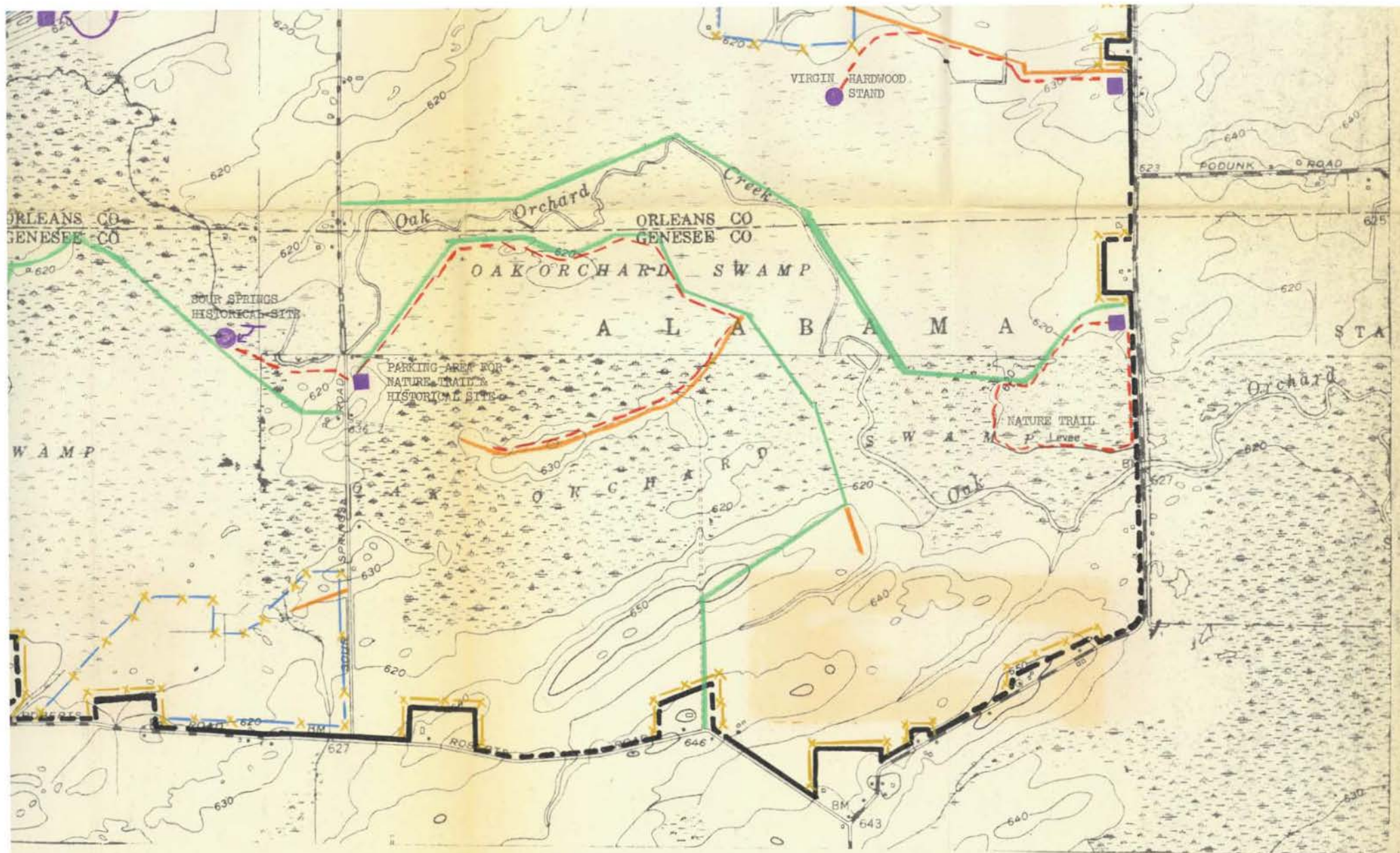
PARKING AREAS



FOOT TRAILS



POINTS OF INTEREST-AS INDICATED
ON MAP



- | | |
|--|----------------------------|
| | BOUNDARY - Existing |
| | BOUNDARY - Proposed |
| | FENCE - Boundary |
| | FENCE - Grazing Management |

- RECREATIONAL FACILITIES
- | | |
|--|--|
| | PARKING AREAS |
| | FOOT TRAILS |
| | POINTS OF INTEREST-AS INDICATED ON MAP |

- | | |
|--|-----------------------------|
| | ROADS (Surfaced-all season) |
| | PATROL TRAILS (Unsurfaced) |