FISHERY MANAGEMENT PLAN

Valentine National Wildlife Refuge
Valentine, Nebraska

Submitted by: _____ Date: _____
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Approval: _____ Date: _____
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I. Background Information

A. Legislative Mandate

Valentine National Wildlife was established by Executive Order 7142 (1935) "as a refuge and breeding ground for migratory birds and other wildlife". The refuge is part of the national refuge system and all fish and wildlife management is the responsibility of the Fish and Wildlife Service. Objectives and strategies addressed in this management plan are in agreement with the background and operating statements approved July 11, 1989. Much of the fishery management actions focus on preventing carp, *Cyprinus carpio,* from destroying migratory waterfowl habitat. Secondary emphasis is to provide quality recreational fishing which is compatible with the refuge's primary mission.

B. Carp Introduction

Carp were introduced into Refuge lakes in the 1930's when Gordon Creek diversion canal (which emptied into Hackberry Lake) was built. With time, all lakes within the drainage contained carp. The canal has not been functioning for many years, but eradication of the carp has been unsuccessful. Refuge lakes south and east of this drainage remain carp-free. Lakes presently containing carp Clear, Dewey, Hackberry, Pelican, Willow, Center and Twentyone. Carp from Plum Creek entered Twentyone Lake when the lake overflowed. During 1986-87, Marsh Lake overflowed into the Plum Creek drainage. Temporary fish barriers were put in place to prevent carp introduction into Marsh Lake.

Historically, several attempts have been made to control carp; including seining, application of toxaphene, and aerial and surface application of rotenone. Complete eradication has not be possible because of the springs and marshes connected to the lakes.

C. Renovation Cycle

Records show a consistent sequence of events lead up to each renovation.

1) The newly renovated lake is restocked with game fish.
2) Fishing pressure responds to the fast growth and initial production of game fish.
3) Fish surveys find a small number of carp present.
4) Northern pike, *Exos lucius,* numbers are reduced by angler harvest and trapping operations,
5) Carp remain unharvested and increase in number.
6) Water turbidity increases dramatically.
7) Waterfowl and angler use declines.
8) The lake becomes totally dominated by carp and renovation is planned.

This cycle has repeated itself every 10 to 15 years.

D. Recent Renovation

The last lake renovation program was from 1975 to 1983. The lakes were systematically renovated beginning at the upper end of the drainage. As much water as possible was mechanically pumped out of the upper lake and into a lower lake prior to renovation. Pumping drained the water out of marsh area and reduced the amount of water

to treat. Lakes renovated were Hackberry (1975), Watts (1976), West Long (1976), Pelican (1979), Whitewater (1980), Dewey (1981), and Clear (1983). Carp eradication was more successful than in previous attempts.

E. Carp Populations

For about seven years after renovation, very few carp existed. This changed in 1986. Surveys collected large numbers of young-of-the-year carp in Dewey and Clear Lake.

F. Control Options

1. Control Barriers

Several options were considered for controlling carp numbers and movement. Carp control barriers were placed at the inlet and outlet of each carp-infested lake to prevent escapement to adjacent lakes. The structures prevented movement of adults but were unable to prevent eggs, fry and small fish from moving downstream.

2. Lake Renovation

Lake renovation was not considered because:

1) The majority of the fish population were game fish.
2) High water levels would not allow for successful application of rotenone.
3) Money was not available to renovate the lake.
4) It was realized it is not possible to eradicate carp in the west marsh of Dewey.
5) The Service is striving toward no use of chemicals on federal lands and waters.

3. Water Manipulation

Adjusting water elevation to reduce spawning habitat was considered. Drop in elevation from one lake to the next is quite small. Lowering water levels would increase carp habitat. Recharge rates are not predictable so lowering water elevations may cause mortality of game fish. Lake levels are being held close to maximum elevation so raising water level would have no impact.

4. Trapping and Removal

Mechanical trapping was tried to determine its effectiveness. Carp concentrated in marshy areas with 3 feet of water and 2 feet of unconsolidated muck bottom. These areas could not be trapped so adjacent shallower areas were baited with corn and fenced with a funnel trap. Catch rate was extremely low so the project was abandoned.

5. Biological Control

Biological control involved increasing predation pressure on carp. The three lakes with carp (Pelican, Dewey, and Clear) were targeted. Three strategies were identified: 1) reduce bag limits of pike and largemouth bass, *Micropterus salmoides*, 2) establish a size-limit regulation, 3) introduce other predatory species.

a. Reducing Bag Limits

Reducing the bag limit was decided against because it would not protect the larger pike needed to feed on one-year-old carp. Anglers would throw back smaller pike with hopes of catching a larger one.

b. Establishing Size Limits

Fishing pressure had kept bass and pike at a small size. Very few bass, greater than 15 inches, and pike, greater than 30 inches, were collected. Size limits would provide a fishing opportunity and protect larger bass and pike. The larger bass would actively prey on small young-of-the-year carp during the warm summer months--

pike are inefficient predators during summer months. During the remaining cooler months, pike would become the primary predator. It was determined a 36-inch size limit on pike would protect pike large enough to feed on one-year-old carp.

c. Introduction of Other Predatory Species

Flathead catfish, *Pylodictis olivaris* were introduced in Dewey in 1986. Initial stocking was about 400 (3 to 5-inch) fish. In 1987, about 125 fish of various sizes were stocked. The largest was 30 pounds. Studies document flathead catfish selectively feeding on bullheads *Ictalurus spp.* and carp. Flatheads are not easily caught by anglers, have a long life span, will not reproduce in refuge lakes, and will withstand low dissolved oxygen levels found during winter months.

G. Establishing Size Limit

A request was made with the State of Nebraska to establish size limit regulations on largemouth bass and northern pike. The Nebraska Game and Parks Commission approved a 15-inch size limit for bass (all Refuge fishing lakes) and a 36-inch limit for pike on Clear, Dewey and Pelican. The regulation went into effect January 1, 1988.

H. Response to Management

Fish populations responded to the new regulations as expected. What was not known, however, was the intensity of response. Hot, dry weather and lower lake levels increased aquatic vegetation and reduced pan-fish recruitment. Habitat Suitability Index (HSI) declines for lakes with over 50 percent of the area having dense aquatic vegetation. The 36-inch regulation virtually protected every pike in the lakes. The pike began growing in size and feeding on game fish, primarily yellow perch, *Perca flavescens*. Pan-fish numbers decreased but those remaining grew quickly and showed exceptionally good body condition. Pike also controlled recruitment of small pike.

Clear Lake which has the poorest HSI (no littoral area) showed the effects first. Pike were actively searching for food. Angler's catch rates for pike increased as pike flesh condition declined. The high catch rate increased angler-use days. When a strong carp Y-O-Y occurred in 1990, the pike effectively preyed on them. The 1991 surveys found no juvenile. Water quality remains good and the time between renovations has been extended.

I. Present Pike Population

At present, surveys show the flesh condition and growth rate of pike declining. Too many pike of one size class exists for the amount of forage available. Length-frequency charts show a large size-class of 22-28 inch pike--protected since 1988--have reduced the number of prey fish and small pike present. If not corrected, flesh condition will worsen and high mortality will occur. The best management action is a controlled slot-size limit. This regulation would reduce the number of pike between 22 and 26 inches and encourage greater survival of small pike and pan-fish. The remaining large pike will experience faster growth rates.

II. Objectives and Management Strategies

The lakes on Valentine National Wildlife Refuge are the main component in the habitat system required to achieve the goals outlined in the operation statement for the Refuge. High-quality water conditions are essential to provide the food and cover for migratory birds, resident wildlife and fish. While management has few options in controlling the levels of water in the lakes, the fish population can be managed to maintain water quality through selective stocking and regulated harvest.

Objective I. Fish Population - Develop and maintain a fish population compatible with migratory bird production and maintenance.

Strategies

1. Keep carp populations in refuge lakes (with carp present) at a density in which less than 0.1 one-year-old-plus carp is taken per unit of survey effort

2. Develop and maintain sufficient populations of large predators (primarily northern pike and largemouth bass) to help control the carp population, thus extending the benefits of lake renovation programs.

3. Prevent the introduction of carp into carp-free lakes.

Objective II. Recreational Fishing - Develop and maintain a quality recreational fishery compatible with migratory bird production and maintenance.

Strategies

1. Designate lakes open to public fishing based on refuge compatibility criteria in 5 RM 20.

2. Develop and maintain fish populations with a high proportional stock density for quality and preferred-size fish in lakes open to fishing.

3. Provide for a range of 10,000 to 15,000 angler-visits annually.

4. Provide facilities such as roads, boat ramps, parking lots, and restrooms on refuge lakes open to fishing.

5. Promote public awareness and understanding of the fishery resource and public involvement in the improvement and maintenance of balanced fish populations in the refuge lakes.

III. Management Program

A. Recreational Fishing Lakes

Lakes presently established as fishing lakes will be managed to meet the objectives stated in Section II. To best meet the objectives, management will provide recreational trophy fishing rather than producing a maximum substained yeild. Fishing lakes include: Clear, Dewey, Duck, Hackberry, Pelican, Rice, Watts, West Long and Willow Lakes. All other lakes, although they may have fish present or have the potential for a fishery, will be managed for migratory birds.

B. Fish Surveys

1. Frequency

Fishery surveys will be conducted by Valentine Fishery Assistance Office (FAO). Survey guidelines described below will be followed. Lakes open to fishing will be surveyed annually. Surveys at different times of the year will address different aspects of fishery management. A spring (mid-May) survey in the cooler waters will indicate winter survival of young fish to age I. An early summer (late June to early July) survey in the warmer water temperatures will sample warm-water species, as well as, recruitment. This survey is critical for making adjustments in stocking requests and changes in fishing regulations. An early fall (September) survey will give an indication of summer production before cold water pushes fish into deeper waters.

Larger fishing lakes (those with northern pike) will be surveyed more intensely than pan-fishery lakes. The larger lakes will be surveyed within the same time period (i.e. same week) in order to allow for a more valid comparison between lakes.

Lakes not open to fishing will be surveyed only as the need arises. This may be after a winterkill, summerkill, or possible introduction of a fish species.

2. Sampling Techniques

Survey techniques will include the use of experimental gill nets, frame (Fyke) nets, and electrofishing. Minimum survey intensity will be 5 frame nets, 2 gill nets, and ½ hour of electrofishing. Electrofishing will be used more extensively during the early summer survey to determine recruitment. The combination provides good survey information and can be accomplished by one survey crew.

Survey techniques will focus on collecting as many fish of each species as possible. Changes in lake levels and vegetation mean changing the placement of nets from one year to the next. However, effort will be made to be consistent in sampling effort and technique--map showing location of sample site will be made. Electrofishing will be done in various habitat areas. Attempt should be made to collect an adequate number of each species to make valid inferences about relative weights (W_r).

All fish collected during sampling will be measured for total length. Measurement will be recorded as the last centimeter covered by the tail. A random sample of fish from each size group will be measured to the last millimeter covered by the tail. These fish will also be

accurately weighed; scale samples will be taken for aging as needed.

3. Sampling Intensity

Refuge lakes with their continuous shallow-lake habitat border close to being classified as deep marshes instead of shallow lakes. Lake bottom and aquatic vegetation varies more than does water depth. Diverse habitat causes a wide variation in catch rate between nets. Small lakes have a greater portion of the lake's fish collected in each net. Extensive surveying to reduce variation in catch rates means collecting and harming a larger portion of the population. For example, statistical sampling on refuge lakes would increase sampling effort by 4 to 10-fold. Information obtained from statistical sampling does not merit the amount of manpower and fish mortality involved.

C. Water Chemistry

Basic water chemistry will be taken on surveyed lakes each year. Chemical tests will include alkalinity, pH, water temperature, and conductivity. Dissolved oxygen and carbon dioxide tests will be done during winter snow cover conditions.

D. Data Analysis

Various measures of information collected from surveys are available for fishery management. However, most of them have some extremely difficult conditions to meet before the information becomes valid. The most difficult condition that must be met is having a statistically valid sample size. Inferences from a small number of fish will be vague but informative. A second condition that is difficult to meet is obtaining a random sample. Each survey technique is bias toward specific species and size of fish. Sampling with one technique will skew the information. Sampling with a wide variety of techniques does not allow the biologist to combine the data and compute statistics. Time of year, time of day, location of sample site, weather, water chemistry, and surveyor also bias fish sampling results.

It is the presence of all these uncontrollable variables that give little justification to maintaining strict consistency in sampling gear specifications, location, and intensity.

Data collected during surveys (including fish lengths, weights, frequencies, and ages) will be entered into computer, using the Fishmate program. The program stores the length-frequency and age information as well as compute statistics about the sample.

1. Relative Weights

Relative weight is a valid measure of a fish's flesh condition compared to a normal population. Relative weights values are easy to obtain and are not biased by the above mentioned variables. The long-term relative abundance of forage and environmental conditions are the factors which affect the flesh condition of fish. These factors that are important in developing management strategies. W_r will be the primary analysis used to monitor fish populations. Comparison of W_r from one year or season to the next will indicate population health trends. Target values will be 95 to 105.

2. **Catch Per Unit Effort** — Catch per unit of effort (CPE) will be computed for four size-classes; substock, stock, quality, and preferred. CPE is not a true estimate of the relative number of each species in the lake. It will, however, add information about the species composition. Comparison of catch rate from one year to the next will be done with extreme caution because statistical sampling conditions have not been met (See Sampling Intensity section).

3. **Young-Adult Ratio** — Young-adult ratio (YAR) is a ratio of substock to stock-size. Survey technique, location, and time of year affect the ratio so care must be made in comparisons. Comparison of YAR will be considered valid when comparing between years and/or lakes using the same technique and time of year.

4. **Proportional Stock Density** — Proportional Stock Density (PSD) is an index computed by dividing the number of quality-size by the number of stock-size. It indicates distribution of size classes. Management goal will be toward maintaining an index range for forage game-fish between 20 and 40 percent. PSD range for predator game-fish will be between 40 and 60 percent. No range is acceptable for carp.

5. **Biomass Per Unit Effort** — Biomass per unit of effort is an estimate of weight of each species collected in the survey. It is not an estimate of total production for the lake. Biomass will be computed using established logarithmic regression equations. The information will give an indication of relationship (percent) of biomass each species represents. This cannot be considered a true estimate for the lake, but it does provide additional insight of the lake's fish composition. Comparison of percentages between years will give an indication of species composition trends.

6. **Aging of Fish** — Scales taken from a sample of fish collected will be aged. The accuracy and value of aging decreases as fish become older. False annulus and irregular growth patterns cause significant variation in age determinations. Information from aged fish will be used to provide information on the condition of a population.

7. **Sample Mean** — Arithmetic mean for size and weight of fish can be misleading. For example, the collection of one 10-pound carp and a dozen 3-ounce carp will give a mean that does not describe existing population. If an arithmetic mean is computed, it should be qualified with a standard deviation value. When a skewed mean does exist, the median and mode would be more accurate ways to describe the population.

8. **Length-Frequency Distribution** — Plotted length-frequency charts give a good indication of the distribution in size-classes. However, this information can be skewed by the sampling technique. For example, gill nets will show a different size distribution than a frame net will. This technique will be used when a large sample size exists.

9. **Mark and Recapture**

Mark and recapture is a labor intensive management technique. The effort involves capturing large numbers of fish, permanently marking them, returning them to the water, and then recapturing a portion of them. Mortality and trap-shy behavior biases estimates. The amount of effort for the information obtained makes this technique prohibitive.

10. **Creel Surveys**

Creel survey is a labor intensive management technique. Information obtained from creel surveys give an indication of harvest rates, size and weight of fish being kept, and angler-use days. Like other techniques its information does not tell the whole story. For example, high angler-use days and low catch rates could mean 1) fish have been biting in the past but not recently, 2) heavy fishing pressure has removed most of the fish, 3) the lake is located near a high recreational use area and is used as a past-time for campers and boaters.

Creel surveys to estimate harvest rate will not be done. Surveys to determine angler-use and overall public attitude will be done.

11. **Proud Angler Awards**

Proud angler awards can be used as a comparative index of quality fishing between lakes. An index of awards per surface acre has some merit. However, catching quality fish from Valentine lakes is common enough that many local anglers do not bother to apply for the award. This information will be used to give an insight into fishing success.

E. Reporting Data

Fishery management recommendations continually change and cannot be addressed in detail in this management plan. Management decisions will come from analysis of survey data. Survey results and recommendations will be made on a yearly basis in the form of a progress report, submitted by Valentine Fishery Assistance Office (FAO). FAO will keep the manager informed of any significant findings or problems. The Service will keep the state district fishery biologist informed of pertinent information.

The progress report will document all activities that occurred on Refuge waters. Data will be presented in CPE, percent biomass, and relative weight tables.

F. Implementing Management Actions

Implementing management recommendations will be the decision and responsibility of the refuge manager. The manager may solicit advice and comments from other sources. Some actions may require the cooperation of Nebraska Game and Parks Commission. Valentine Fishery Assistance Office will assist in implementing special management actions.

1. **Fishing Regulations**

Special fishing regulations will be established, as necessary, by the refuge manager. All new regulations will be advertised in the appropriate media, as well as, signed at the specific lakes.

2. **Spawning**

Refuge lakes will be made available as a source of eggs for all game species. Valentine FAO will coordinate the

spawning operation with the concurrence of the refuge manager.

3. Stocking

Stocking requests will be submitted by Valentine FAO. Stocking of new species will not be done unless shown to be in agreement with the goals of the refuge. No stocking of crappie will be done in any lake other than Clear.

4. Fish Barriers

Fish barriers will be installed at the inlet and outlet of all lakes that have carp present. A carp barrier between Clear and Dewey will be in place, even though both lakes have carp. When water is not flowing between lakes, the carp barrier will remain, in case of unexpected rise in water levels.

Fish barriers will be installed in carp-free lakes that drain into carp-infested waters. This includes structures on Marsh, Pony, Watts, and Dad's overflow.

5. Water Levels

Water level management on fishing lakes will be compatible with refuge mission. Water will be discharged from Dewey immediately after ice-out until mid-May. The water will be discharged into Clear Lake to help it maintain more desirable depths. Young fish that escape through the fish barrier on Dewey will help supplement the low recruitment of game fish that occurs in Clear. Once carp spawning begins, discharge will be stopped if possible.

Water level in Willow will continue as presently established. All control structure boards will remain removed to allow for wanton flow.

G. Public Facilities

Refuge trails will be maintained to provide access to all fishing lakes. During wet conditions access routes to some lakes may be limited or closed. Each fishing lake, except Duck, will have at least one primitive boat launch site. An outdoor toilet will be located on the east boat launch site at Pelican, the east end of Hackberry, and one on the north side of Dewey. Modern restroom facilities are available also at Hackberry Lake (headquarters). No garbage barrels will be located at any parking or boat launch site.