NORTH AMERICAN WATERFOWL MANAGEMENT PLAN
PRAIRIE POTHOLE JOINT VENTURE

D R A F T

ARROWWOOD WATERFOWL MANAGEMENT DISTRICT

IMPLEMENTATION STRATEGY

Participants:

U.S. Fish and Wildlife Service
North Dakota Game and Fish Department
Ducks Unlimited Inc.
North Dakota Action Group
BlueStem Company

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FOREWORD

This document will guide the implementation of the North American Waterfowl Management Plan (NAWMP) in the ARROWWOOD WETLAND MANAGEMENT DISTRICT, North Dakota. The approach is consistent with the objectives of the NAWMP. Development and implementation of the strategies is a cooperative effort. The success of this strategy will depend on the efforts of numerous federal and state government agencies, private conservation organizations, agriculture interest groups, and private land owners.

This strategy is based on the recognized need to impact broadscale changes in land use, and develop intensive management programs for key areas. The strategy process is a Multi-Agency Approach to Planning and Evaluation (MAAPE) and is directed at promoting actions that provide long term benefits to both wildlife and agriculture interests.

This implementation strategy was developed as a result of directions from the Prairie Pothole Joint Venture (PPJV) Technical Committee. The US Fish and Wildlife Service Habitat and Population Evaluation Team (HAPET), Bismarck, North Dakota conducted meetings with interested parties to review pertinent information that formed the basis for the strategy. The process relies heavily on the use of information available on waterfowl population dynamics and habitat characteristics of the wetland management district. Because of this the population and habitat objectives and the landscape treatment programs are more specific than those outlined by the NAWMP.

ACKNOWLEDGEMENTS

The development of the implementation strategy and this document was based on the efforts of numerous individuals and organizations. It would be impossible to acknowledge all of the cooperators and participants. Because the strategy is an information based management process, it seems appropriate that the contributors to this information base should be the target for acknowledgement. We hereby simply acknowledge the efforts of all those who spent countless hours in the field collecting data, often under adverse environmental conditions, and sometimes at personal risk. We thank the individuals who labored to convert the mountains of data into useable form and those who produced meaningful results. If it were not for this tremendous effort we would lack the ability to answer even the most elementary questions regarding the resource we are responsible for managing.

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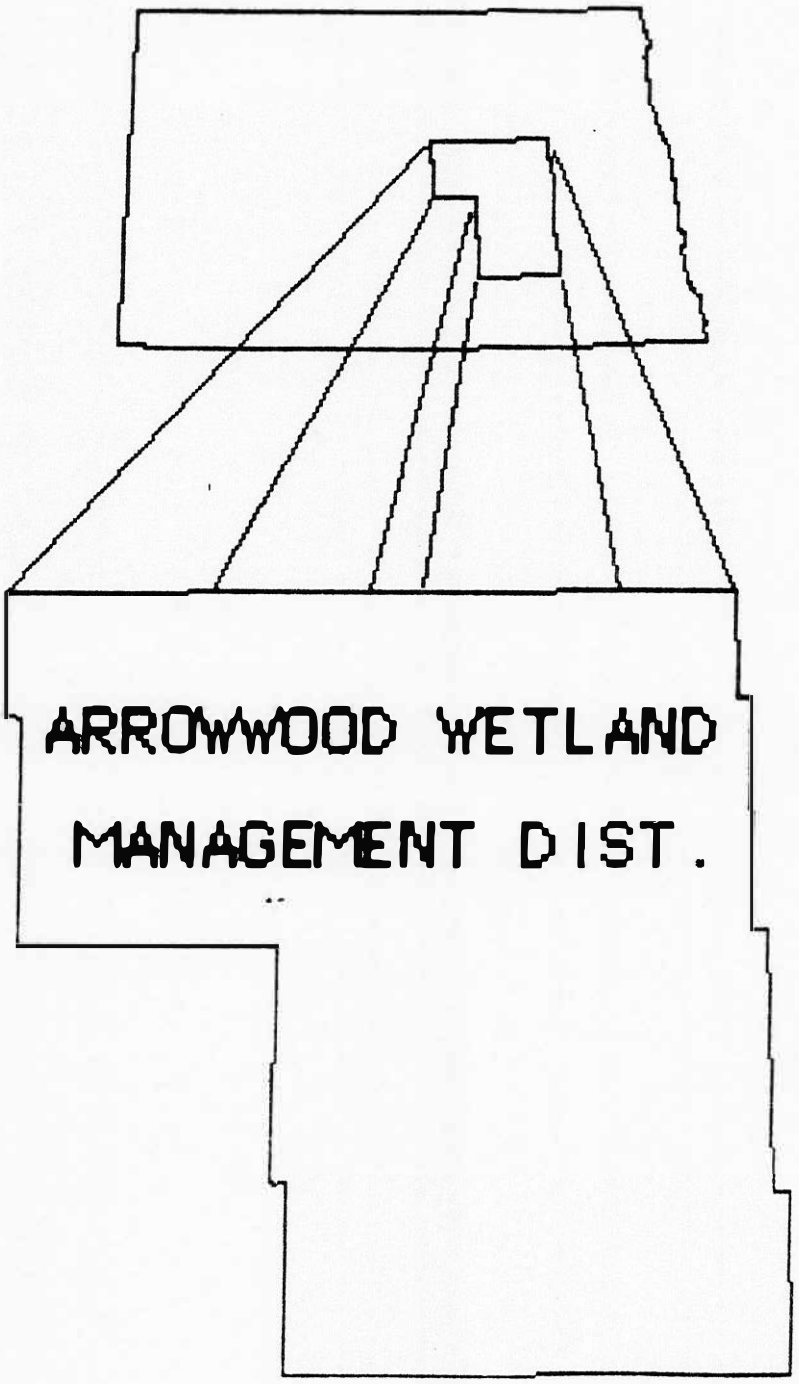
ARROWWOOD WETLAND
MANAGEMENT DIST.

INTRODUCTION

The prairie-parkland region of the north-central United States (U.S.) and Canada has historically been recognized as the most important duck breeding area in North America. The numerous wetlands created by past glacial activities and the rich soil which supports a variety of grasses, forbs, shrubs, and scattered clumps and bands of trees, is ideally suited for many species of nesting waterfowl. The terrain is generally flat to gently rolling and is part of the physiographic region known as the Great Plains. The characteristics which make the area suitable for waterfowl also makes the region highly suitable for agriculture and particularly for small grain production. It is this activity that has changed the landscape as the demand for agriculture products has increased worldwide. Although agriculture has been an important feature in the northern plains for over 100 years, it has been particularly intensive during the last 3 or 4 decades. Historically, duck populations in the prairies fluctuated annually as wetland and upland features were affected by short term climatological events. However, since the early 1970's many duck populations breeding in the northern plains have declined even though long-term climatological patterns have not changed appreciably. For example, the mallard breeding population in the cooperative survey area of the U.S. and Canada declined from about 10 million in 1970 to 5.3 million in 1991. During the same period, pintail populations fell from 6.4 million to 1.8 million, and blue-winged teal from almost 5.0 million to 3.8 million. The sum of the breeding populations for the 10 most common duck species totalled about 38 million in 1970. This number had declined to 24 million in 1991, a change of almost 38 percent. Government and private conservation agencies responded to the decline of ducks by developing the North American Waterfowl Management Plan completed in 1986. The plan was designed to address the problems facing waterfowl populations and a "Joint Venture" approach to regional planning and management action has evolved.

The U.S. Prairie Pothole Joint Venture (PPJV) Implementation Plan was completed in 1989. The PPJV area includes portions of Montana, North Dakota, South Dakota, Minnesota, and Iowa. The PPJV presented general goals and objectives and proposed various actions to improve the status of duck populations. However, it was recommended that the plan should be further stepped down to local levels where more specific objectives would be developed. It was decided that within portions of the PPJV area where FWS Wetland Management Districts (WMD) existed that specific implementation strategies should be developed for each WMD. This document serves that purpose for the Arrowwood Wetland Management District. The implementation of the strategies is not, however, solely the responsibilities of the FWS.

The Joint Venture participants recognize that the health of waterfowl populations is tied to the overall health of the prairie

environment. Waterfowl are considered a key indicator to the condition of the landscape and the long-term dependencies that wildlife and humans have in common. Therefore, much of the proposed actions outlined in this document are designed to change the landscape to achieve long-term improvements for multiple uses.

STRATEGY DEVELOPMENT

Treatment Methods and Placement Guidelines

In the prairie region of the U.S. the single most important factor depressing duck numbers is low nest success due primarily to nest destruction by predators. Predators are also responsible for the deaths of many nesting hens. As grassland and shrub cover is reduced by intensive agricultural activities, ducks and other birds are forced to nest in ever dwindling fragments of the remaining cover. Often the only nesting sites available are small isolated areas such as roadside ditches, abandoned farmsteads, rockpiles, etc. Predators are quick to key in on these areas and concentrate their hunting there. In some habitats, predators such as fox, raccoon, skunk, and mink are able to depredate virtually every duck nest and many of the attendant hens. Many of the management treatments recommended here are directed at providing breeding ducks with secure nesting sites. Treatments presented are based on both traditional methods and new innovative approaches.

Treatment application and location must not be a random or haphazard event. **It is important that managers evaluate the landscape and prescribe a treatment that addresses the limiting factor(s).** A series of meetings involving management and research experts were held over an 18 month period to develop guidelines for applying treatments. These treatments and associated guidelines are presented in Appendix IV.

Objectives

The success of this implementation strategy required setting measurable population objectives that could be linked to habitat in a predictable manner. The Mallard Model was used to assess the current recruitment capability of the WMD (Appendix III). Population objectives were directed toward increasing the potential recruitment rate to a level that would result in a specific growth in the population. A habitat treatment strategy was then developed that would result in attaining the population objectives. The Mallard Model and data from population and habitat surveys are integral parts of this process because they provide the mechanisms by which population objectives and habitat treatments can be linked and, ultimately, how success can be measured.

Next, a series of meetings were held which involved participants from various locally represented conservation and land use organizations. These included federal, state, local, and private entities. The primary purpose was to: 1) review the current "state of the WMD" by examining information on duck populations and habitat specific to the area; 2) set population objectives; 3) determine which treatments should be applied; 4) decide the level (amount) at which each treatment should be applied. Then the group simulated application of treatments using a random sample of Four Square Mile plots from the WMD as a representation of the landscape. Subsequently, the FWS HAPET Office in Bismarck, ND predicted the results of the simulated treatments by using population/habitat models to determine if the population objectives were attainable based on the habitat treatments. Later, meetings were held between a small committee representing the WMD and HAPET to "fine tune" the habitat management strategy. The WMD committee then completed this document. Finally, models were used to predict the population changes expected after simulating implementation of the strategy.

This process will take advantage of new information as it becomes available. This will result in a dynamic strategy that will undergo periodic review and revision. Tracking progress, monitoring populations, evaluating treatments, and research efforts need to be structured to be compatible with this implementation strategy. Some of these activities have already been initiated. Information on other migratory birds and resident wildlife should be linked to the substantial information base of waterfowl. This will allow the identification and placement of management actions that provide the most mutual benefits to the wildlife community.

INFORMATION BASE

An adequate information base is imperative to the proper management of any resource. Throughout the process of developing this strategy the participants relied on information from numerous sources. It is because of this large amount of available information that waterfowl management can be placed on a relatively sound scientific foundation compared to that for many other migratory birds. Of particular importance to developing this implementation strategy, were information tools designed specifically to provide an understanding of duck populations in each WMD.

Surveys

In 1987 the FWS began conducting an annual waterfowl population survey that tied breeding population estimates and recruitment indices for several species to wetland and upland habitat features. This was made possible due to technological advances in processing remotely sensed habitat information and the use of models developed from data collected for prairie nesting ducks. In FWS Region 6,

the survey is conducted within 15 WMDs in North Dakota, South Dakota and northeastern Montana. The survey is based on a sample of 335 Four Square Mile plots from which pairs are counted, wetlands are inventoried and upland cover monitored. This habitat sample and survey are used to estimate the current habitat and recent populations of ducks in the WMDs.

Mallard Model

The mallard is the most abundant and widely distributed duck in North America. It is also the most important duck in the harvest. Because of these characteristics, more data is available regarding mallard biology than for any other duck species. Consequently, the development of this implementation strategy relied heavily on our understanding and measurements of mallard population parameters. Biologists and statisticians from Northern Prairie Wildlife Research Center recently compiled and synthesized vast amounts of data on mallard biology and developed a population model specific to female mallards. The model is particularly suited for understanding the influence of various habitat characteristics on mallard recruitment. It also provides a mechanism for simulating habitat changes and predicting the impact on mallard recruitment. Thus the modeling process is a valuable tool for planning management strategies. The assessment and predictive capabilities are fundamental to developing the population objectives and habitat treatment strategy. The use of models can also provide a basis for evaluation. While a model cannot be used to evaluate directly, it can be used to focus evaluation efforts on the appropriate parameters. In effect, evaluation efforts can be directed at validating the model. Models can also be used to predict certain events and expand these predictions to other areas.

While the Model is mostly tied to mallard biology, other duck species have similar habitat needs and have experienced population declines as a result of low recruitment. These species (i.e. blue-winged teal and pintail) are expected to benefit from many of the actions based on the Mallard Model. The Mallard Model therefore is used as a "yardstick" to assess the overall health of the habitat base. In addition to the Mallard Model, models for other species are being considered for development. A prototype model for pintail is currently available but has not been adequately tested. As these and other tools become available they will be incorporated into the process via periodic updates and modifications.

ARROWWOOD WETLAND MANAGEMENT DISTRICT

Description:

The Arrowwood Wetland Management District consists of four counties located in east-central North Dakota (Eddy, Foster, Stutsman and Wells). Typical of most of North Dakota the area's primary industry is agriculture. The eastern two-thirds of the District is located in the "Drift Prairie" which is characterized by gently rolling topography with numerous wetlands. The intensively farmed land in this area accommodates primarily small grain production. The western one-third of the district lies within the "Missouri Coteau" which is characterized by sharply rolling hills dotted with thousands of various size wetlands.

The District contains:

150	Waterfowl Production Areas	(37,000 acres)
4	Garrison Diversion Unit Wildlife Development Areas	(3,000 acres)
21	FmHA Conservation Easements	(13,000 acres)
	Arrowwood National Wildlife Refuge	(16,000 acres)
	Chase Lake National Wildlife Refuge	(4,400 acres)
15	State Owned Wildlife Management Areas	(11,000 acres)
	National Audubon Society, Alkali Lake Sanctuary	(2,250 acres)
	Numerous Federal Wetland Easements	(70,000 acres)

Assessment of Habitat and Duck Populations

Habitat and duck population status for Arrowwood WMD was measured from a random sample of Four Square Mile plots.

The availability of certain habitat types is given in Appendix I. Breeding population estimates for the years 1987-90 are given in Appendix II and potential recruitment rate indexes with and without Conservation Reserve Program cover is presented in Appendix III.

Population Objectives for the Arrowwood Waterfowl Management District

Population Objectives:

1. Increase the potential recruitment rate of mallards in an average wet year from the current level of .534 to between .57 and .61 (based on the Mallard Model prediction).

2. Increase the water base to attract 8 to 10 percent more mallards, N. pintails, blue-winged teal, gadwall, and N. shovelers in an average wet year with current continental populations.

3. Increase the fall flight of these species by 10 to 15 percent over the 1987 level in an average wet year.

(These factors should result in a mallard population growth rate of between 1.07 and 1.1 annually, which will allow the population to double[1] in about 10 years. Comparable changes can also be expected for other major duck species.)

Management Strategy:

Predator Barriers	
Exclosures (Planted Cover on Land Presently in Private Ownership)	5,426 acres
Exclosures (Grassland Wildlife on Land Presently in Private Ownership)	378 acres
Exclosures (Planted Cover on Public Land)	2,403 acres
Fenced Peninsulas	1,357 acres
Nest Structures (Culverts)	7,412
Manage Natural Islands (1-2 acre islands)	75
Agricultural Lands	
Convert Cropland to Planted Cover (Wildlife Mix)	12,196 acres
Delayed Haying	1,069 acres
No-till Winter Wheat	17,778 acres
Underseed Small Grain With Sweetclover	5,976 acres
Grazing Systems (Private Land)	150,617 acres
Maintain CRP[2]	208,887 acres
Mini Joint Venture (Grazing Systems Incl. Public Land)	11,352 acres
Public Land Management	
No-mow on Road Right-of-Way	6,043 acres
Improve cover on Waterfowl Production Areas	934 acres
Wetlands	
Wetland Restoration/Creation	
Temporary	2,435 acres
Seasonal	17,175 acres
Semi-Permanent	5,597 acres
Convert Permanent to Semi-Permanent Class (Arrowwood NWR)	8,420 acres
Cattail Control	3,461 acres
Protection (through Easements or other programs)	50,798 acres
Other	
Install Wood Duck Boxes	1,494
Remove Trees (near WPA's, Refuges, etc.)	114

[1]Because some ducks produced in Arrowwood WMD may not return there, population surveys may not detect this population growth.

[2]Up to 250 acres of CRP per sample 4 square mile plot were maintained where the mallard breeding pairs exceeded 19 and at least one-half of the nests were initiated in CRP as predicted by the Mallard Model. Other CRP was also designated for maintenance when it appeared critical for duck production.

PREDICTED RESULTS

If the above habitat treatments are located according to the guidelines presented in this document, two general changes are expected. The potential for recruiting young ducks into the population will be improved in some areas of the WMD and areas with high recruitment potential will become more attractive to breeding waterfowl. This will result in a larger average breeding population, greater production, and increased survival of nesting hens. A positive growth rate in the population will occur with increased fall flights. Table 1 shows the changes in breeding population, recruitment, and fall flight that are expected for five species of ducks.

It is predicted that the pair, recruitment, and fall flight objectives will be met for the five most common duck species in the WMD (Table 1). The mallard recruitment rate is expected to increase from .534 to .578, which is within the objective range established.

The impact of some treatments such as grazing systems and cattail control cannot be properly evaluated because of lack of pertinent data. However, these treatments are expected to contribute to the overall health of the landscape.

Table 1 Expected changes in breeding pairs, recruits, and fall flight resulting from meeting the habitat objectives in this implementation strategy.[1]

	Pre-Treatments			Post Treatments				
Species	Pairs	Recruits	Fall Flight	Pairs	Change	Recruits	Fall Flight	Change
Mallard	25,500	27,200	68,100	29,000	14%	33,500	80,100	18%
Blue-Winged Teal	147,400	227,000	463,500	159,800	8%	266,200	522,900	13%
Gadwall	37,700	62,700	123,100	40,900	8%	73,500	139,200	13%
N. Shoveler	20,400	31,700	64,400	22,100	8%	37,100	72,600	13%
N. Pintail	7,500	6,900	19,300	8,300	8%	8,100	21,400	11%

[1]Based on single year change. As hen success increases the population should increase annually within the WMD until the habitat carrying capacity is reached.

Other Benefits

Diving duck species such as canvasbacks, redheads, and lesser scaup would benefit from some of the treatments, particularly the increases in wetlands. It is expected that many non-game bird species, especially those that nest on the ground, would receive substantial benefits from the management action outlined here. Watershed protection will result from the increased wetlands and upland management, and wind related soil erosion will be reduced. We can speculate that increases in the biodiversity associated with the landscape in the WMD will result from implementing the strategies outlined. However, it is important to note that the strategy would allow the loss of about 116,000 acre of CRP. While the participants indicated a desire to maintain all of the CRP in the WMD it was assumed that the CRP program would be reduced by the US Department of Agriculture. Therefore, the strategy was to maintain that CRP associated with the highest density of ducks and, characteristically, wetlands. This action would result in a net loss in upland cover compared to that currently available and could result in a reduction in numbers of some wildlife species, particularly those that do not tend to concentrate near wetlands.

The initial modeling of duck benefits did not include treatment "nest structures." This was done intentionally because this treatment is specific to increasing the recruitment of mallards among the duck species. When nest structures are added to the strategy, the overall predicted recruitment rate for mallards increased to .726 compared to .578 when all treatments except nest structures are applied. This will result in approximately 8,600 additional recruits in the fall flight.

IMPLEMENTATION

The primary purpose of this implementation strategy was to develop a treatment scheme that would result in attainment of population objectives. The scenario presented represents only one of an infinite number of possibilities. Increases in the use of one treatment may offset deficient application of another. As the implementation proceeds, modifications in the application of certain treatments may be necessary. Also, it is assumed that other treatments will be developed, and guidelines will be modified as new information becomes available.

This document does not identify the responsible parties for carrying out the implementation. It is intended that all partners in the NAWMP should play a role. However, there is no delegation of responsibility for specific tasks. It is also recognized that new partners may emerge with time. Therefore, this implementation strategy was developed so that present and future partners can have a common document to guide their participation.

Decisions about which treatments to apply in specific projects must take many factors into account. **The guidelines presented in Appendix IV should be followed and be primary in the decision process.** Still, several treatments may be reasonable for a particular landscape. Therefore, comparative cost/unit gain, political realities, funding source, willingness of cooperators and other factors will likely influence the final decision. To be effective, managers will need to embrace a pro-active, objective-oriented approach to applying treatments to the landscape.

EVALUATION

Monitoring

Monitoring programs for habitat and waterfowl populations are already in place. These programs can detect major changes of the landscape and trends in duck populations. The Four Square Mile survey is the primary tool for monitoring. Periodic updates to the population and habitat data will be added to this document. Other activities to monitor nest success and annual survival need to be initiated.

Tracking

A system to track accomplishments needs to be developed that is consistent for all participants. This is necessary to measure the accomplishments.

Assessment

Assessment programs are an important part of this strategy. It is through this effort that links can be made between landscape treatments and waterfowl population responses. There are various methods for evaluating management actions. Emphasis should be placed on validating the models that are used to drive the implementation strategy. Evaluation, then becomes a feedback mechanism that can be used to improve the tools that guide subsequent efforts.

Some treatments or applications may be assessed as part of the monitoring effort. Others cannot be evaluated this way and may require other approaches. Basically, all assessment efforts should be designed to measure responses of waterfowl to management actions. The NAWMP Continental Evaluation Committee is currently developing evaluation guidelines for joint ventures. When these are finalized, a more comprehensive evaluation program will be developed for the PPJV and will become part of this implementation strategy.

NON-WATERFOWL SPECIES

This implementation strategy was developed primarily to target the objectives of the NAWMP, PPJV. However, the strategy is directed toward correcting some of the fundamental problems with the landscape. It is expected that many other species of migratory birds and resident wildlife will benefit from the proposed actions. Wetland ecosystems will be maintained and improved, and upland habitat will be more secure. Other benefits such as watershed protection, soil conservation and overall environmental quality will be realized. In sum, the result of the implementation will be to increase the diversity of habitat which will increase the diversity of biological populations that occupy the landscape.

APPENDICES

Appendix I: Availability by acreage and percent distribution for various habitat classes in the Arrowwood Wetland Management District, North Dakota. (Based on the Four Square Mile sample.)

Habitat Class[1]	Acres	Percent of Total
Cropland	1,520,000	49%
Conservation Reserve Program (CRP)	328,000	10%
Grassland	631,000	20%
Grassland Wildlife	45,000	1%
Hayland	76,000	2%
Planted Cover	41,000	1%
Right of Way	48,000	2%
Temporary Wetlands	23,000	1%
Seasonal Wetlands	96,000	3%
Semi-Permanent Wetlands	146,000	5%
Permanent Wetlands	53,000	2%
Barren	43,000	1%
Other[2]	83,000	3%

[1]Certain features such as islands, nest structures, and predator exclusion areas are not included.

[2]Includes scrubland and woodlands as well as "other" habitats described below:

Appendix I. (cont.): Description of 26 Habitats Commonly Used for Planning and Model Simulations.

CROPLAND: Cropland areas are tilled and planted to grain or row crops or they may be left fallow. For purposes of model simulation cropland was divided into the following classes:

CROPLANDFALLPGR (Cropland fall-plowed grain) includes all areas that were fall-plowed and that are planted to grain crops in the spring.

CROPLANDFALLPLRO (Cropland fall-plowed row crop) includes all areas that were fall plowed and that are planted to row crops in the spring.

CROPLANDNOTILL (Cropland No Till) includes areas where a grain crop has been seeded into the stubble from the previous year.

CROPLANDSTUBLGRN (Cropland Stubble Grain) includes areas left in stubble the previous fall, plowed and then planted to small grain crops.

CROPLANDSTUBROCR (Cropland Stubble Row Crop) includes areas left in stubble the previous fall, plowed and then planted to row crops.

CROPLANDSUMRFALO (Cropland Summer Fallow) includes areas that are not planted in spring but are plowed in summer and left fallow till fall.

CROPLANDWTRWHEAT (Cropland Winter Wheat) includes areas that are plowed and planted to winter wheat in the fall.

CROPLANDFALLSEED (Cropland Fall Seeded) includes areas that are plowed in fall and seeded to grain crops other than winter wheat, for example rye.

GRASLAND — Includes areas vegetated with various mixtures of grasses, forbs, and often short woody species. This habitat is most frequently used for pasture.

GRASLANDFENCED — Includes the same habitat as grassland but is left idle and protected by an electric barrier fence.

GRASLANDWILDLIFE — Includes the same habitat as grassland but is situated on lands managed for wildlife production (State WMA's, FWS lands, etc.).

HAYLAND — Includes areas that have been plowed and seeded to various mixtures of grasses and legumes for forage. They are hayed annually. In most cases this type is represented by alfalfa hay on private land.

ISLANDS — Includes small manmade islands (about 1½ acres in sized) that have frequently been constructed in prairie wetlands. This class does not include large natural islands.

NESTBASK — Includes open-topped cone-shaped baskets filled with hay and culverts. Such structures are used to attract nesting mallards in the prairie pothole region.

OTHER — Includes various small patches and clumps of nesting cover. The areas must be smaller than 5 acres in size except for linear features. Typical examples are corners and small patches of grassland included in cropland fields, rock piles present in cropland, wetlands, and sometimes in haylands, and small clumps of trees or shrubs in the above types. The class also includes all shelterbelts and farmsteads regardless of size.

PLNTCOVR — Includes a number of grass/legume mixtures planted for establishing wildlife cover. This

	type most commonly occurs on FWS lands. When applied to private land it is referred to as "Wildlife Mix."
PLNTCOVRFENCED	Includes the same cover as above but is surrounded by an electric barrier fence.
R OF WAY	Includes the area between road surface and the fence in grassland and between road surface and cropland in farmed areas.
SCRBLAND	Includes areas of shrubs 0.5-6 m tall and exceeding 5 acres in size.
SEAS.WETLAND	Includes wetland in the shallow marsh zone as described by Stewart and Kantrud (1971).
SEMI.WETLAND	Includes wetland in the deep marsh zone described by Stewart and Kantrud (1971).
TEMP.WETLAND	Includes wetland in the wet meadow zone described by Stewart and Kantrud (1971).
PERM.WETLAND	Includes all wetland with a permanently-flooded water regime.
CRP	Includes all areas enrolled under the Conservation Reserve Program of the 1985 farm bill.
TRUE.BARREN	Includes all areas where there is no probability of a duck nesting such as road surface, parking lots, and rooftops. The model converts some areas such as open water in SEMI.WETLAND to barren, however, these areas are not included in TRUE.BARREN.
WOODLAND	Includes areas with woody plants (trees or tall shrubs) 6 m or greater in height and with an aerial cover by tree crowns of 30% or greater. These areas also must be 5 acres or more in size to be classes as woodland.

Appendix II: Breeding pair estimates for nine species of ducks in the Arrowwood Wetland Management District 1987-1990. (Based on Four Square Mile survey.)

	Species									
DISTRICT	MALLARD	GADWALL	WIGEON	BW. TEAL	SHOVELER	N. PINTAIL	REDHEAD	CANVASBACK	L. SCAUP	ALL SPECIES[1]
YEAR										
1987	37,900	37,700	0	147,400	20,400	7,700	41,800	15,800	13,800	374,500
1988	38,600	14,100	1,500	78,600	6,500	7,400	24,900	6,300	12,100	211,400
1989	33,300	33,200	4,600	51,900	10,800	4,600	12,200	4,800	6,900	183,500
1990	28,300	39,700	1,800	31,500	5,500	1,400	14,600	3,000	6,700	141,100

[1]Includes G.W.-teal, wood duck, ringnecked, and ruddy duck.

Appendix III: Recruitment Rate Potential for Mallards Nesting in the Arrowwood Wetland Management District with and without CRP. (Based on modeling the District's Four Square Mile sample)[1].

	Potential Recruitment Rate[2]
With current CRP acreage	.534
Simulated Conversion of CRP to Cropland	.400

1. Assumes an average number of wet wetlands.
2. Recruitment rate is defined as the number of young females fledged per adult female in the breeding population. A recruitment rate of about .49 is needed to maintain a population.

Appendix IV: Treatments Used to Benefit Breeding Waterfowl in the PPJV and Associated Guidelines for Application.

Guidelines for Applying Management Treatments
to Benefit Breeding Waterfowl in the Dakotas and Montana

PREDATOR BARRIERS

Exclosures

Exclosures are designed to separate nesting hens and nests from ground predators. Electric fences are the most commonly used barrier. Exclosures represent an intensive management effort that requires initial expense and regular maintenance throughout the nesting season. Mallards and gadwalls are the primary duck species attracted to fenced areas, but other species of birds, including non-game, also benefit. A density of 1 - 2 duck nests per acre should be targeted.

Location

- Locate near good wetland habitat, preferably where 10 - 20 percent of the land within ½ to 1 mile of the exclosure is wetland.

- Within one-half mile of 60+ acres of semipermanent, wetland and as many seasonal wetland as possible.

- Avoid fresh or slightly brackish permanent or semi-permanent wetlands, stockdams, dugouts, and streams. Avoid buildings adjacent to areas to be fenced. These situations increase occurrences of mink. If unavoidable place exclosure ≥220 yards from such mink habitat.

- Surrounding area (up to 1 mile radius) should have relatively poor nesting cover, and low nest success (use mallard model).

- Terrain inside fence should be level to gently rolling and soil should be high quality, and stable.

- Fenced area should be void of features that attract predators such as trees, rock piles, buildings, etc. and wetlands.

- Secure brood travel cover should be available between exclosure and brood water. Small grain cover will usually be adequate (dense cover is likely not available if area is appropriate for fence).

Size

- 20 - 80 acres. Areas less than 20 acres will probably not attract enough duck pairs to justify cost. It takes almost as much effort to maintain a 20-acre fenced area as it does an 80-acre one.

- Exclosures should be 3 or 4 sided with no inside (concave) corners.

Management

- Fences should be designed to allow deer to exit.

- Establish dense cover with minimum residual Robel value of 1.5 decimeters. Cool season grass (such as intermediate wheatgrass)/legume mix is suitable. Buckbrush, rose, etc. is also suitable.

- Close exclosure and remove predators just prior to nesting in spring. Use track sign to determine if predators are inside when gates are closed. Do not trap outside exclosure.

- Check fence and maintain predator control regularly (daily/weekly) through nesting season.

- Open fence at end of season to prevent prey buildup and to allow free access in and out by deer.

- In dry years consider that exclosures may not be worth maintenance effort.

- Consult Ducks Unlimited, Inc. or FWS Extension for fence design.

Fenced Peninsulas

Location

- >5 acres located on semipermanent wetlands.
- >50 acres.
- Brackish and alkaline wetlands are preferred.
- Substantial pair and brood habitat nearby.

- Other guidelines similar to stand-alone exclosures.

Peninsula Cutoff

This treatment creates a water barrier that in essence converts a peninsula into an island. Gadwall, mallards, and blue-winged teal are the principal species nesting on cutoffs. Other duck species such as blue-winged teal, pintail and lesser scaup are found in lesser proportions.

Location

- Select large brackish or alkali wetlands because they are likely to have low use by raccoons and mink (cutoffs are not 100 percent predator proof).

- Near ≥60 acres semipermanent brood wetlands with emergent vegetation and large numbers of seasonal wetlands within ½ to 1 mile to attract pairs.

- Where surrounding attractive nesting cover is minimal.

- Cut-off channel should create ≥100 yard water barrier with trench not deeper than surrounding bottom, but not less than 2 feet.

- Slope edge of trench to not create a cut-off bank that attracts muskrat and consequently mink.

- Avoid areas with substantial emergent vegetation near cut-off.

Size

- Peninsula size is site specific, but because of expense >5 acres is recommended.

Management

- Trap peninsulas annually just prior to nesting season and check occasionally (search for tracks) to see if predator removal was complete.

- Establish nesting cover with Robel value of 1 - 1.5 decimeters if existing cover is inadequate. Brush type cover is suitable and should require no annual maintenance. Seeding grass/legume cover in winter when construction is completed, has worked well.

- Remove trees, tall shrubs >1.5 m, rock piles, debris, etc. that may provide cover/attraction for predators.

Consult with Ducks Unlimited, Inc. or FWS Extension for techniques and specifications for creating cut-offs.

Nest Structures

Properly designed nest structures provide nest sites for mallards, that are secure from ground predators if properly placed. Hay bales may not provide adequate protection from raccoon and mink.

Location

- In Class III (Stewart and Kantrud) or semipermanent wetlands. Semipermanent wetlands are preferred.

- ≤6 feet from emergent vegetation.

- Where water depth is 18 inches minimum (when wetland is at normal level).
- Avoid areas with trees nearby.
- Where the attractiveness of surrounding cover is marginal for duck nesting (cropland and grazed pasture dominate).
- Where nest success in existing cover is low.
- Areas with high density of wetlands and mallard pairs.
- No more structures than the number of mallard pairs in the area (maximum density = 1 per acre).

Management

- Culvert type nest structures should be filled with soil to anchor in place and provide base for vegetative growth (culvert type structures are low maintenance compared to some other types).
- Baffle may have to be installed to allow mallard hen and Canada geese to co-exist.

For information on availability and installation of nest structures, contact FWS Extension, ND Game and Fish Department, SD Department of Game and Parks.

Create Islands

Small, man made islands provide secure nesting sites that are used particularly by mallards, gadwall, and lesser scaup. Other duck species and Canada geese will also use islands in lower concentrations. Some islands attract extremely large numbers of nesting ducks (>30 nest per acre).

Location

- Large (≥25 acres) alkali wetlands with water depth of about 2 feet (shallow depth minimizes construction cost).
- Where numerous wetlands exist in surrounding area to provide pair habitat and brood cover.
- Where nest predation in mainland cover is known or expected to be high.
- In areas where competing cover is minimal.

- Where a minimum water gap ≥100 yards from shore can be maintained (farther the better)

Size

- Generally, islands should be constructed at 3/4 to 1 acre surface area above water. Smaller islands have been made and used successfully by ducks, but are subject to more rapid loss due to wave and ice erosion than larger islands. Islands are expensive to build, so only the most suitable sites should be used. In general, ten 1 acre islands are better than one 10 acre island from duck use and success standpoint.

- Numerous islands can be created in a single wetland but islands should be separated so they are within the breeding territories of more breeding pairs.

Management

- Islands should be covered with a minimum of 4 inches of top soil and planted with vegetative cover (intermediate or tall wheat/legume mix is preferred). Shrubs such as buckbrush and rose require some effort to plant, but require little maintenance and are very attractive to ducks. Shrubs should be planted in small patches in the center of the island where grass/legume mix was purposely not planted.

- Visit islands annually in the spring and trap predators that are present. Maintain predator control through nesting season.

- Gulls can cause problems on some islands, but may be deterred by planting dense cover to eliminate bare areas.

Consult with Ducks Unlimited, Inc. or FWS Extension for information on construction techniques, permits, etc. that are involved in island creation.

Manage Natural Islands

Natural islands occurring in wetlands often represent "ready made" secure nesting sites that are attractive to several duck species. While some islands are adequate "as is," most require some form of enhancement or management to obtain maximum benefits. These efforts can be costly, so prioritizing sites is important.

Location

- Any natural island may have potential, however, certain characteristics may be associated with the greatest benefits; alkali - best, brackish, then freshwater.

- ≥100 yards from shore (farthest is best).

- Near good wetland complex with ample pair and brood habitat.

Size

- One-tenth acre and larger.

Management

- Each island is unique and may require different levels of attention.

- Establish cover on islands if it currently does not exist.

- Remove debris, trees, tall shrubs >1.5 m, etc.

- Trap in spring to remove predators. Especially in wet years.

- Minimize human disturbance.

Other

- Island characteristics will vary. Some islands may consistently be free of predators. Still, this needs to be determined and an annual visit is recommended. Island use by nesting ducks is extremely important for prioritizing efforts. Monitoring use will allow maximizing benefits per effort and provide information that can be used to identify other potential sites or management strategies.

- Some islands are suitable only in wet years when high water inundates connecting spit. Dry years may provide opportunity to "disconnect" islands from shore

- HAPET will investigate the use of an automated system using remote sensed data and GIS techniques to identify and maintain a register of islands in the prairie pothole region.

AGRICULTURAL LAND

Convert Cropland to Planted Cover, CRP, or "Grassland Wildlife"

Planted cover, such as that planted on lands enrolled in the USDA Conservation Reserve Program (CRP), and idled native grasslands provide attractive nesting cover with relatively high nest success for upland nesting ducks. Similar benefits may be realized from planted cover established on state, federal, and private lands specifically managed for upland nesting lands. Cropland (which has generally low attractiveness and nest success) converted to one of these habitat types may be the most beneficial method of improving the overall environmental quality of an area.

Location
- In areas with high wetland density.

- Best to target areas with mid-level nest success $\geq$15 and moderate predator densities. Example - Missouri Coteau preferable to black desert.

Size
- Little information exists on habitat block size vs nest success, but most agree that target should be $\geq$160 acres. The larger the better. Widely separate smaller fields may attract more nesting hens than one large block, although nesting success may be higher in the larger block.

Idle Agriculture Land

This treatment simply sets aside either cropland or pasture into a non-use class. This treatment is most often used in association with other enhancement or Extension agreements. Such lands will most likely become dominated by weeds and, eventually, perennial grasses such as quack or brome.

These include:
- Lands on peninsula cut-offs
- Inside a predator exclosure
- To protect land during interim agricultural programs.
- Protect created or restored wetlands from erosion.

Other uses of this treatment should follow guidelines established for converting cropland to planted cover.

Contact FWS Extension office for additional information.

Delayed Haying

Hay fields, especially alfalfa, can provide attractive nesting cover that is relatively secure from nest predators. Most hayland provides little residual cover in early spring and thus does not attract ducks until later when new growth occurs.

Subsequent haying takes place prior to when most nests hatch, destroying the potential benefits of this cover type. In some circumstances delayed haying may provide the extra time needed for nests to hatch.

Benefits from delayed haying operations must be assessed annually.

Location

- Target areas with currently high numbers of wet ponds (wet years) and high duck numbers.
- Target blocks of hayland (not narrow strips) with uniform, monotypic vegetative stands and terrain.
- Avoid fields with trails, vehicle tracks, debris, dugouts, windmills, buildings, etc. These features attract predators to venture into the field.
- Target areas with low amounts of competing cover. The idea is to pay for delayed haying only on fields that will have a high number of nests.
- Avoid fields <20 acres.

When

- Delay haying until July 15

NOTE: Checking fields by dragging or other means will allow you to determine the value of that field, possibly prior to setting up an agreement.

Grassland Easements

The objective of grassland easements is to maintain these areas by preventing conversion to cropland. Currently the FWS' Realty Division is administering an easement program and is in the process of developing criteria. Haying is delayed on grassland easements until after July 15, but there are no restrictions on grazing. With the exception of delaying hay operations, grassland easements do not provide benefits greater than those currently in place on grasslands. Easements may be taken on crop-

land with provisions to reestablish grassland cover. In this case, advantages to duck recruitment potential may be realized.

Location

- Target areas with high density of wetlands, especially in temporary, seasonal, and semipermanent classes (wetlands can be on areas adjacent to the easement).

- Avoid areas with trees or tall shrubs >1.5 m.

- Give priority to coyote dominated areas vs fox dominated. Nest success in intensively grazed grassland is low compared to denser nesting cover. Recent studies are demonstrating that nest success on coyote dominated areas is generally higher than on those areas dominated by red fox.

- Give priority to native pasture vs tame - introduced grasses.

- Target best soils available in area.

Size

- Target relatively large blocks $\geq$640 acres. The larger the better. There is little data to support the idea that large blocks of grassland are better than small blocks. However, the general consensus among researchers and managers is that this is a reasonable assumption.

Management

- Some grasslands and cropland will need to be reseeded/seeded to be beneficial or meet the requirements for taking an easement. This may cause the price to be prohibitive if cost is to be borne by the agency obtaining the easement.

For more information contact the FWS Realty office in your state.

Minimum Till Spring Wheat

Residual cover from standing stubble can provide limited nesting cover which is attractive to early nesting species, particularly pintails. Fields with limited cover are preferable to aggressively tilled fields. Additionally, the residual cover may provide moisture and soil conservation benefits.

Location

- Target areas near wetlands and where soil erosion is most severe.

- Avoid sunflower fields. Predators in the spring are attracted to fields that were planted to sunflowers the previous year.

For more information and assistance, contact FWS Extension office.

No-Till Winter Wheat

Winter wheat sown in standing stubble provides moderate residual cover in the form of stubble and vegetation. Winter wheat often gets a head start on spring sown small grain and provides a better cover for nesting ducks and other birds. Nest success in winter wheat has been found to be acceptable (about 30 percent (Mayfield)).

Location
- Recommended for any area, but especially in intensive agricultural areas.

- Avoid fields with rock piles, junk piles, etc.

- Target large, uniform blocks of land.

- Target areas with high number of wetlands.

Other
- Stubble should be tall (12 inches) to trap snow. This is important for seedling survival.

- Rotate flax every third year, especially if weeds are a problem.

Sweet Clover Underseeding with Small Grain

This practice is recommended for spring seeded small grain fields that will be fallowed the following spring. The sweet clover protects soil during the fallow period, adds nutrients, and traps snow during the winter. No nest success data is available, but it is expected to be comparable to other cover with similar height and density. Benefits of this practice are reduced substantially if haying takes place earlier than July 10, so incentive payments are usually necessary for delayed haying.

Location
- Areas scheduled for fallow the following spring.

- Target areas with high numbers of wetlands.

- Select areas with limited acres of CRP or other highly attractive cover (to avoid competing with this type of more stable cover).

Size
- ≥20 acres (larger is better).

Grazing Programs

The benefits of grazing systems are mutual, providing increased forage for cattle and increased cover for nesting ducks. Sometimes WPA's are included in grazing programs to manage vegetation on the WPA (Mini Joint Venture).

Location
- Any pasture area is appropriate for a grazing system, but coyote dominated areas should result in a higher yield then areas dominated by red fox.

- Select areas where pasture can compete effectively for duck nests. Avoid areas with large acreage in CRP or other dense cover.

- Select areas with high numbers and acreage of wetlands (high pair potential).

Size
- The larger the better. Target for areas ≥320 acres, with no maximum size limit.

PREDATOR CONTROL (Management)

Skunk Control

Skunks are the primary nest predator in some areas. Skunks are easy to trap in early spring (April) and, when combined with other management effort, skunk removal can provide an extra margin of security for nesting hens.

Location

- In areas where the predator community is simple and skunk densities are not extremely high (Otherwise, alternate predators and adjacent skunk populations will quickly fill voids created).

- Target areas where coyotes are the primary canine predator as opposed to red fox.

- Concentrate effort near areas treated by other enhancement methods such as islands, planted cover, delayed haying, etc.

  Or alternately implement a broad scale intensive effort over a large area (township, county).

When

- Prior to whelping, April 1 to May 1.

Red Fox Control

Red fox are a major cause of nest loss and kill many nesting hens in some parts of the Prairie Pothole Region of North America. Broad scale control of fox is generally not practical. However, special circumstances may warrant fox removal that benefit ground nesting ducks. Data should be collected to establish the effectiveness of the effort in each case.

Location

- In areas where the predator community is simple and fox densities are not high.

- Near areas treated by additional enhancement measures such as on islands, delayed haying, planted cover, etc. This practice is probably beneficial only where fox densities are low or where complete control can be obtained.

Coyote Management

Field studies indicate that areas dominated by coyotes will generally have higher nest success than similar areas dominated by red fox. Coyotes tend to displace red fox, yet coyote densities are usually lower in the areas they dominate (in the PPJV). It is not clear whether densities will increase as coyotes become better established.

At this time, it does not seem appropriate to actively encourage coyote populations by eliminating harvest or transplanting.

The most appropriate strategy at this time is to maintain coyote populations at low density levels by discouraging broad scale intensive control programs.

PUBLIC LANDS MANAGEMENT

Public Lands

These lands provide opportunity to maximize duck production. This category most often refers to FWS, refuges, and WPA's but may include state owned wildlife management areas and other types of state and federal land such as school land or that administered by the Corp of Engineers, Bureau of Land Management, Bureau of Reclamation, etc.

Location

- Where existing lands occur. Additional purchases should be made in areas where wetland densities are high or where there is a potential for developing wetlands in association with secure nesting cover.

Management

- 1. Native grass. Maintain in healthy state by using fire, grazing, or mowing treatments. Mismanaged native grasslands tend to succeed to blue grass dominated cover that is of little value to nesting ducks.

- 2. Planted cover. Planted cover needs to be renewed occasionally. The technique will vary and may include mowing and grazing, but disturbing soil or complete reseeding may be necessary.

  Treat after July 15 (later if necessary).

  Maintain a Robel value of 1.5 dm in the spring (residual vegetation).

Reduced Mowing on Highway Right-of-Way

Highway and Railroad Right of Ways (ROW) often provide the only substantial area of cover in some landscapes. Nest success on some of these areas has been found to be relatively high. Competing interests such as haying, weed control, safety and aesthetic appeal all tend to compromise the value of ROW for nesting ducks. For example, if all unimproved section lines were maintained in grass cover this would provide 1.5 million acres of habitat in North Dakota. Other states could benefit similarly depending on laws governing the use of these areas. However, not all ROWs are equally valuable as nesting areas for ducks. In fact some ROW areas are extremely attractive to predators.

Location

- Select wide Right of Ways along well traveled hard surfaced roads (divided highways and Interstate highways are best).
- Target areas with numerous wetlands.

Management

- Mow every second year after July 15. Alternate mowing by area.
- Determine which areas have high nest success and target these for management. This avoids attracting ducks to ROWs with high predation rates.

WETLANDS

Wetlands are the principal attracting feature for all duck species. Their margins and emergent vegetation may provide nesting cover for some species and they are necessary for brood security. The proper mix and location of wetlands is important. Improper placement of wetlands can be detrimental to the overall status of duck populations.

Wetland Restorations

Large numbers of wetlands have been destroyed primarily by draining. Filling due to direct action or sedimentation has also contributed to the loss. Restoring previously drained wetlands can often be a cost effective way to increase the number of breeding waterfowl that use an area. Restoring any wetland appears to be desirable, however, to gain the maximum benefit for ducks, priorities need to be established.

Location

- Give top priority to areas where quality nesting cover is abundant, nest success is high ($\geq$20 percent based on Mallard Model or nest studies), and wetland numbers are low.

- Pair habitat (small wetlands) should be restored in areas that have adequate brood habitat.

- Brood marshes should be developed in areas with adequate pair ponds.

- Exceptions to these rules could be made for specific wetlands that provide all the requirements for certain species such as canvasbacks.

Size

- The size of restored wetlands will be partly determined by the previously existing wetland, cost, objective, and numerous other factors. Data on pair/wetland relationships indicate that more pairs per acre can be attracted to several small ponds, say 1 to 5 acres compared to fewer larger ponds. In other words, five 2-acre ponds will likely attract more pairs than one 10-acre pond.

Wetland Creation

This treatment involves creating new wetlands where none existed previously. Techniques could include blocking/damming water ways, dredging ponds, or diking low lying areas.

Location

- Create wetlands in association with high quality nesting cover and where nest success is high.
- Avoid watersheds where soil erosion in the drainage is likely to fill in the wetland.
- Target areas where ratio of watershed to surface area is 10:1.
- Target areas where complementary ponds (brood, pair, etc.) exist or will be built to provide a wetland complex. Do not build isolated ponds.
- Avoid areas near riparian habitat (mink habitat).

Type/Size

- Do not build dugouts adjacent to (edge of) natural semipermanent wetlands (dugouts of this type attract mink and do not provide sufficient shallow zone).
- Plan pond to provide mix of semipermanent or better water depth and also ample shallow zones.
- Target areas with fertile soil.

Wetland Easements and Acquisition

Acquiring easements or fee title to wetlands does not change the current availability of water. However, it does protect existing wetlands from potential loss.

Location

- Select areas where existing cover or potential for cover development will provide secure nesting sites.
- Where loss of wetlands is imminent or potential for loss is high.
- Target wetlands near areas where nesting habitat treatments have been applied. This protects wetlands in areas where money has been spent to provide for increased recruitment.

Create Seasonally Flooded Wetlands

This treatment involves installing water control structures in low lying hay meadows that are naturally or artificially drained. The process results in mutual benefits. Water is trapped on hayland and provides wetland habitat attractive to breeding ducks similar to naturally occurring seasonal wetlands. Later in the season when many nests are near hatching, water is drawn off these areas to allow increased vegetation growth and haying. This action allows increased hay production in many years.

Location

- Locate in areas with other pair wetlands including semi-permanent type.
- Target areas with brood water within 1 mile.
- Select areas that have sufficient quality nesting cover to result in high nest success (use Mallard Model), or where predator control will be part of the strategy.

Other Considerations

- Control structure should not allow the water to be drained below its previous low level.
- For breeding pairs, drawdown should occur between June 1 to July 15.

Cattail Control

Cattails become so dense in some wetlands that those wetlands become virtually useless to ducks. Various techniques such as burning, forced grazing, discing, herbicides, mowing and water manipulation are used to reduce or eliminate cattail growth from some portion of the wetland and provide open water. The objective is to create a hemi-marsh situation ideally with a moat of open water around cattails in the wetland center, or an interspersion of open water and cattail.

Location

- Select areas with existing nesting habitat other than the cattail marsh or use in combination with upland habitat improvement, nest structures or islands. (Exception to this may be justifiable if canvasbacks or red heads are targeted. If so, locate where canvasback or redhead occur.)
- Select cattail marshes where water is virtually non-existent.

Contact the Fish and Wildlife Service, Extension or Ducks Unlimited, Inc. for details on techniques.