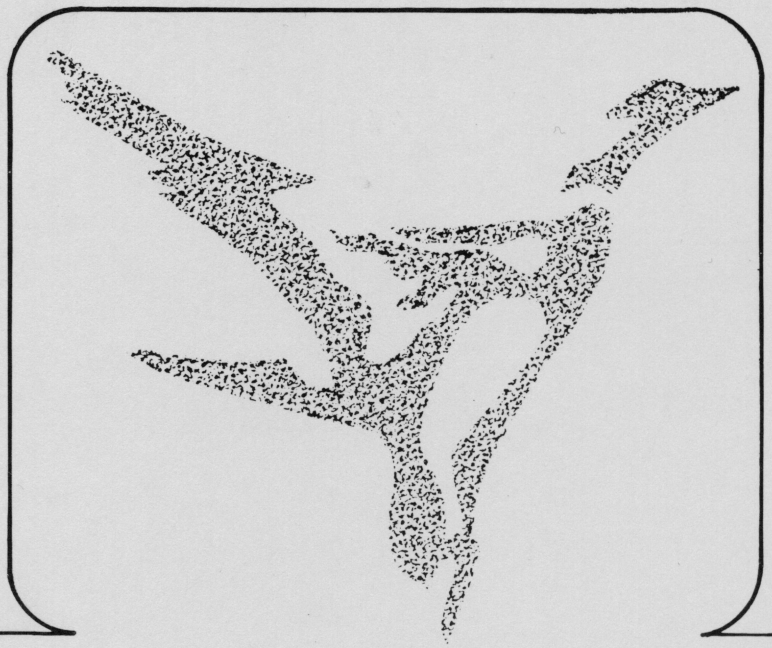
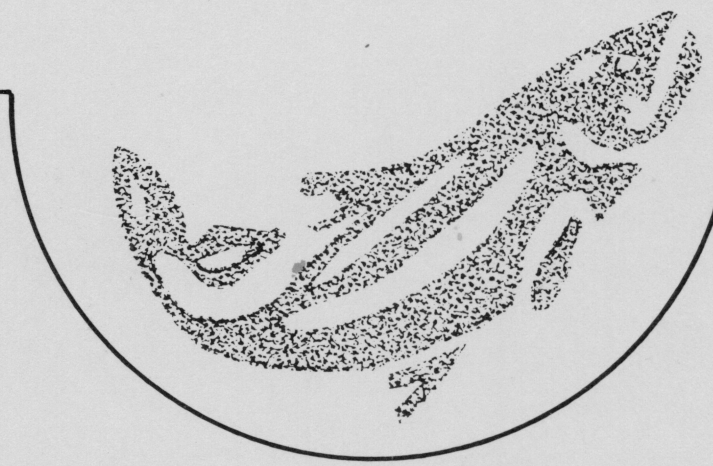
US Army Corps
of Engineers
Walla Walla District

Lower Snake River Fish and Wildlife Compensation

Design Memorandum No. 20

Game Bird Farm Alternative: Habitat Development





April 1986

LOWER SNAKE RIVER FISH AND WILDLIFE COMPENSATION PLAN
DESIGN MEMORANDUMS

No.		Date
1	Fish Facilities Site Selection Report	November 1977
	Letter Supplement No. 1, Changes to Idaho Steelhead and Oregon Hatchery Facilities	October 1978
	Letter Supplement No. 2, Changes to Satellite Facilities for Lyons Ferry Hatchery	December 1978
	Letter Supplement No. 3, Changes to Idaho Steelhead Hatchery Facilities	April 1979
	Letter Supplement No. 4, Changes to Idaho Steelhead Hatchery Facilities, Crystal Springs	December 1980
	Letter Supplement No. 5, Changes to Idaho Spring Chinook Hatchery Facilities, Dworshak National Fish Hatchery Expansion	February 1981
	Letter Supplement No. 6, Changes to Idaho Spring Chinook Hatchery Facilities - Sawtooth, and Idaho Steelhead Satellite Facilities - East Fork Salmon River	May 1981
	Letter Supplement No. 7, Changes to Oregon Summer Steelhead and Spring Chinook Hatchery Facilities	September 1981
	Letter Supplement No. 8, Changes to Lyons Ferry Hatchery, Phase II, Rainbow Trout and the Spring Chinook Satellite Facilities	March 1983
	Letter Supplement No. 9, Changes to the Lyons Ferry Hatchery Steelhead Acclimation Ponds	November 1983
	Letter Supplement No. 10, Changes to the Idaho Spring Chinook and Steelhead Trout Hatchery Facilities, Clearwater Hatchery	May 1984

LOWER SNAKE RIVER FISH AND WILDLIFE COMPENSATION PLAN
DESIGN MEMORANDUMS (Continued)

No.		Date
1	Fish Facilities Site Selection Report (continued)	
	Letter Supplement No. 11, Clearwater Hatchery Satellite Facilities; Red River, Crooked River, and Powell, Idaho	March 1986
2	Real Estate Fish Facilities Report	November 1977
	Letter Supplement No. 1, Malad River Hatchery Site	January 1980
	Letter Supplement No. 2, Lookingglass Creek Fish Hatchery	February 1980
	Letter Supplement No. 3, Crystal Springs Hatchery	December 1980
	Letter Supplement No. 4, Sawtooth Hatchery and East Fork Salmon River Satellite Facility	March 1982
	Letter Supplement No. 4A	May 1982
	Letter Supplement No. 5, Washington Satellite Fish Facilities, Lyons Ferry Hatchery Acclimation Ponds	December 1982
	Letter Supplement No. 6, Lyons Ferry Hatchery, Tucannon River Satellite Facility	January 1983
	Letter Supplement No. 7, Irrigon Fish Hatchery	May 1983
	Letter Supplement No. 8, Wallowa River Hatchery	January 1984
	Letter Supplement No. 9, Big Canyon Satellite Facility	April 1984
	Letter Supplement No. 10, Water Collection Facilities, Crystal Springs Hatchery	June 1984

LOWER SNAKE RIVER FISH AND WILDLIFE COMPENSATION PLAN
DESIGN MEMORANDUMS (Continued)

No.		Date
2	Real Estate Fish Facilities Report (continued)	
	Letter Supplement No. 11, Clearwater Hatchery	June 1984
	Letter Supplement No. 11A	February 1986
	Letter Supplement No. 12, Dayton Pond, Lyons Ferry Satellite Facility	December 1984
	Letter Supplement No. 13, Little Sheep Creek Satellite Facility	December 1984
	Letter Supplement No. 13A	March 1985
	Letter Supplement No. 13B	May 1985
	Letter Supplement No. 13C	September 1985
	Letter Supplement No. 14, Red River and Crooked River Satellite Facilities	January 1986
	Letter Supplement No. 15, Imnaha River Satellite Facilities	April 1986
2A	Wildlife Compensation and Fishing Access, Real Estate	December 1979
	Letter Supplement No. 1, Idaho Fishing Access	September 1982
	Letter Supplement No. 2, Idaho Fishing Access	August 1983
	Letter Supplement No. 3, Yakima River and Bailie Boys Ranch Areas	December 1983
	Letter Supplement No. 4, Idaho Fishing Access, White Property	April 1985
3	McCall, Idaho, Summer Chinook Hatchery System	March 1978

LOWER SNAKE RIVER FISH AND WILDLIFE COMPENSATION PLAN
DESIGN MEMORANDUMS (Continued)

No.		Date
4	Lyons Ferry, Washington, Fish Hatchery	June 1979 Revised July 1980
	Letter Supplement No. 1, Instream Habitat Improvement	June 1981
	Letter Supplement No. 2, Barge Loading Facility	July 1982
	Supplement No. 1, Fish Hatchery Water Supply	February 1980
5	Lookingglass Creek, Oregon, Fish Hatchery	September 1979
	Supplement No. 1, Auxiliary Groundwater Supply System and Miscellaneous Hatchery Completion Work	January 1986
6	Wildlife Compensation and Fishing Access Site Selection	November 1979
	Letter Supplement No. 1, Element X Site Location Modification	January 1984
7	Hagerman National Fish Hatchery Expansion	February 1980
8	Idaho Fishing Access Site Selection	March 1981 Revised August 1982 Revised March 1983 Revised October 1983
9	Dworshak National Fish Hatchery Expansion - Spring Chinook Rearing	February 1981
10	Lyons Ferry Hatchery Acclimation Ponds	January 1985
11	Irrigon Fish Hatchery	March 1983
12	Wallowa River Fish Hatchery Expansion	March 1983

LOWER SNAKE RIVER FISH AND WILDLIFE COMPENSATION PLAN
DESIGN MEMORANDUMS (Continued)

No.		Date
13	Little Sheep Creek Satellite Facility	December 1984 Revised December 1985
13.1	Big Canyon Fish Facilities	December 1984
13.2	Imnaha River Satellite Facilities	April 1986
14	Sawtooth Fish Hatchery	February 1982
15	East Fork Salmon River Satellite Facility	December 1981 Revised July 1982
16	Magic Valley Steelhead Hatchery (formerly Crystal Springs Hatchery)	July 1982
	Letter Supplement No. 1, Comparison of Structures	January 1984
	Supplement No. 1, Spring Collection System	February 1986
17	Clearwater Fish Hatchery	October 1984
	Supplement No. 1, Hatchery Water Supply	
18	Red River and Crooked River Satellite Facilities	December 1985
19	Lyons Ferry Hatchery, Tucannon River Satellite Facility	May 1983
20	Game Bird Farm Alternative, Habitat Development	Revised April 1986

LOWER SNAKE RIVER FISH & WILDLIFE COMPENSATION PLAN
FISH HATCHERY FACILITIES

PERTINENT DATA

HATCHERY	FISH TYPE	POUNDS	CONSTRUCTION COST ($1,000)	DATE OF COMPLETION	SATELLITE FACILITIES
LOOKINGGLASS	Spring Chinook	69,600	4,965	Dec 82	Big Canyon Creek Imnaha Lookingglass Wallowa Hatchery
IRRIGON	Steelhead	279,600	11,292	Apr 85	Wallowa Hatchery Big Canyon Creek Lookingglass Little Sheep Creek
LYONS FERRY	Fall Chinook Spring Chinook Steelhead Trout	101,800 8,800 116,400 45,000	22,257	Phase I-Sep 82 Phase II-Sep 84 Phase I-Sep 82 Phase I-Sep 82	Tucannon Hatchery Curl Lake Cottonwood Dayton Pond
SAWTOOTH	Spring Chinook	149,000	12,163	Jan 85	East Fork Salmon River Sawtooth
DWORSHAK	Spring Chinook	70,000	1,710	Jul 82	Dworshak
CLEARWATER	Steelhead Spring Chinook	350,000 91,300	26,443	Mar 88	Red River Crooked River Powell
MAGIC VALLEY	Steelhead	291,500	9,876	Nov 86	Sawtooth East Fork Salmon River
HAGERMAN	Steelhead	340,000	8,486	Jun 84	Sawtooth East Fork Salmon River
McCALL	Summer Chinook	61,300	5,053	Jul 80	South Fork Salmon River

LOWER SNAKE RIVER FISH AND WILDLIFE COMPENSATION PLAN
DESIGN MEMORANDUM NO. 20

GAME BIRD FARM ALTERNATIVE: HABITAT DEVELOPMENT

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GAME BIRD FARM ALTERNATIVE: HABITAT DEVELOPMENT

SECTION 1 - PROJECT AUTHORIZATION

a. The Lower Snake River Fish and Wildlife Compensation Plan (LSRFWCP) was authorized for construction by the Water Resources Development Act of 1976, Public Law 94-587, 94th Congress. The applicable portion of the Act reads as follows:

> Section 102. "...The following works of improvement for the benefit of navigation and the control of destructive floodwaters and other purposes are hereby adopted and authorized to be prosecuted by the Secretary of the Army, acting through the Chief of Engineers, substantially in accordance with the plans and subject to the conditions recommended by the Chief of Engineers in the respective reports hereinafter designated...."
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> * * *
>
> Specifically, "...Fish and Wildlife Compensation Plan for the Lower Snake River, Washington and Idaho, substantially in accordance with a report on file with the Chief of Engineers, at an estimated cost of $58,400,000."

b. The special report on the LSRFWCP was forwarded to the Secretary of the Army by letter dated 6 January 1977, subject: Special Report -- Lower Snake River Fish and Wildlife Compensation Plan, Lower Snake River, Washington and Idaho. In the forwarding letter it was stated that the Corps of Engineers would report to Congress on the progress of the authorized Compensation Plan within 5 years of first receipt of funds for the project. A "Special Report for Congress" was prepared by Walla Walla District and sent forward to higher authority in March 1983. In summarizing that report for the Secretary of the Army in a 6 March 1985 letter, the Chief of Engineers noted that no change in or of existing authority is required to modify the game bird stocking feature of the authorized plan.

SECTION 2 - COMPENSATION REQUIREMENTS

a. With the completion of Ice Harbor, Lower Monumental, Little Goose, and Lower Granite Locks and Dams on the lower Snake River, 33,890 acres of reservoir have been established. That acreage includes 14,400 inundated acres, most of which were bottom lands and steep hillside grasslands with basalt outcroppings. The resulting loss of upland game bird hunting was discussed in detail in the LSRFWCP Special Report (1975). To compensate for this loss, the Special Report recommended the release of 20,000 game birds annually for a period of 20 years. This was to be accomplished through a lump-sum payment to Washington Department of Game (WDG) to provide for the production of those game birds. The lump-sum payment was to be a capitalized amount sufficient to sustain the program through the 20-year period.

b. This Design Memorandum will deal only with the game bird production program for the State of Washington as described in the Compensation Plan.

advance payments does not apply to payments to states where the services to be provided are reasonably available only from the state - 57 Comp. Gen. 397 (1978); 39 Comp. Gen. 285 (1959). Our proposed agreement with WDG will provide for a lump-sum payment in the amount of $2,125,000 which will fund WDG's payment to such private landowners who commit and agree by appropriate instrument to provide the lands and access for game bird habitat development and the WDG administration and other program related costs over the 18-year life of the project. Reporting requirements and sufficient fiscal controls to determine underachieving or default are discussed elsewhere in this DM, but will, in the Government's sole discretion, be sufficient cause to terminate the Cooperative Agreement and require the immediate return of all unexpended monies with accrued interest. Funding for the GFA program will come from construction monies under the LSRFWCP. WDG agrees that funding in this manner satisfies the Corps responsibility for the game bird stocking portion of the LSRFWCP. WDG will submit annual reports to the Corps detailing field and fiscal activities accomplished under the program each year.

b. WDG may provide a minimal level of game bird releases (up to approximately 3,000 birds). The annual number of game birds released will be jointly determined between WDG and the Corps of Engineers. Acquisition and release of game birds will be accomplished by WDG using GFA program funding. The game bird release portion of the program must be closely coordinated between the Corps and WDG to ensure compatibility with established management programs on Corps' lands. Game bird releases should be targeted for Corps-owned wildlife lands in southeastern Washington or private lands actively participating in the game farm alternative program.

c. Farms under this program would provide public hunting opportunities on a short-term basis (from 1 to 18 years). This is separate from and in addition to the public hunting provided in the Element X portion of the LSRFWCP.

SECTION 3 - GAME FARM ALTERNATIVE

3.01. GENERAL CONCEPT.

a. When the Compensation Plan (1975) was being prepared in the early 1970's, the WDG policy encouraged the game farm rearing and release of game birds for the promotion of hunting. However, in the 1980's, WDG policies were revised to the extent that all state-operated game farms in eastern Washington were phased out of production and less than 1,000 birds are now released annually in eastern Washington.

b. It is now widely accepted by wildlife biologists that pen-rearing and release of game birds is not cost effective in most situations and tends to provide a lesser quality hunting experience compared to hunting of wild birds. However, release of pen-reared birds may be acceptable in some areas where hunting pressure is high and habitats can provide a high rate of return of birds to the bag.

3.02. GAME FARM ALTERNATIVE STUDY.

In 1980, WDG recommended to the Corps that a 3-year study be accomplished to investigate the feasibility of producing an equivalent amount of game birds through the establishment of habitat developments on privately owned farms in southeastern Washington. The results of that 3-year pilot study (Boe et al. 1983) are presented in Attachment A, Game Farm Alternative Study.

3.03. GAME FARM ALTERNATIVE IMPLEMENTATION.

a. This Design Memorandum (DM) requests authority for the District Engineer to implement the advance funding authority set out in the LSRFWCP by paying to WDG the sum of $2,125,000 to provide game birds by the alternative method of enlisting private landowners in southeastern Washington, by appropriate lease or other agreement, to provide and establish on their lands upland game bird habitats with public hunting access. WDG will administer and maintain the game bird program over an 18-year period. It is our proposal to enter into a Cooperative Agreement with WDG using an agreement format authorized by Section 6 of the Federal Grants and Cooperative Agreement Act of 1977, 31 USC 6305 and the Walla Walla District regulations NPWOM 1180-1-8 (31 Jan 85) which will provide for appropriate fiscal controls to protect the Government's interest. Inasmuch as the enabling legislation (LSRFWCP) authorized "advance funding," no violation of the specific prohibition contained in 31 USC 3324 will occur. Secondly, the Comptroller General in a 1980 decision stated that if advance funding can be characterized as a grant, the prohibition of Section 3324 does not apply. Finally, the policy against

SECTION 4 - SITE SELECTION CRITERIA

4.01. GENERAL.

Sites will be selected based on their proximity to known upland bird populations, types of habitat requirements needed (limiting factors), public access capabilities, acreage of site, willingness of farmer, and habitat quality of site.

4.02. LOCATION OF SITES IN SOUTHEASTERN WASHINGTON.

Sites chosen for inclusion in this program shall be located in the area impacted by the lower Snake River projects, i.e., in southeastern Washington proximal to the lower Snake River (Plate 1). Scope of area acceptable for this program should adhere to the limitations outlined for Element X acquisitions in Design Memorandum No. 6, Wildlife Compensation and Fishing Access Site Selection (November 1979). Preferably, sites should be near the lower Snake River.

4.03. TYPES OF HABITAT DEVELOPMENTS.

a. The extent and type of habitat development will be determined on a case by case basis. Improvements will be made according to those habitat components which are lacking on each individual site. Benefits are highest with the development of nesting cover in irrigated areas. However, compensation to the farmers will also be highest in the irrigated sites and the cost per bird produced will be high. Grass waterways/terraces produce birds at the lowest cost per bird, but very few birds are produced in these developments. Fencing of nesting cover and woody areas produce birds at a relatively low cost per bird.

4.04. PUBLIC HUNTING REQUIREMENTS.

To provide the hunter-use days intended by the implementation of this program, each ownership enrolled in the program must agree to allow public hunting on their land. Extent of a landowner's lands which are opened to public hunting shall vary based on acreage available, landowner desires, and safety factors. However, because the main objective of this program is to provide public hunting opportunities, WDG should negotiate for maximum acreage for public access.

SECTION 5 - FUNDING

5.01. COSTS.

a. Costs are based on a lump-sum payment to implement the program during an 18-year period. The equivalent of 2 years (as agreed by WDG and the Corps) of the original 20-year game-bird stocking program was accomplished by the stocking of game birds (pheasants) on Corps project lands during 1981-1984 and through the production of game birds during the pilot study for the game farm alternative. The lump-sum payment for the remaining 18 years of the program was negotiated with WDG to be $2,125,000, based on the following calculations:

(1) 20,000 pheasants released annually for 18 years,

(2) present cost of a pen-raised pheasant (includes transportation and release) $9.00,

(3) 5.5-percent annual growth factor (source: Data Resources, Inc., Fall 1985), and

(4) 11-3/8-percent rate of return on investment (source: return on 18-year Treasury Bill).

b. A portion of the $2,125,000 may be used annually by WDG to raise and release game birds as described in paragraph 3.03.b.

c. The cost ($9) to raise and release a game-farm bird was used to determine the total lump-sum payment to WDG for the program. However, it was noted by Boe et al (1983: page 49) that the estimated cost to produce a naturally reared game bird is in excess of $15. WDG and the Corps agreed that benefits accruing from habitat developments and wild-reared game birds heavily outweigh the apparent economic difference. Those benefits include: increased public hunting access, increased hunting opportunities from wild- versus pen-reared game birds, increased habitat values for big game and nongame species, and increased aesthetic values.

5.02. ADMINISTRATION BY WDG.

a. WDG will make annual payments to landowners in the program following a determination that habitats are successfully established. It is anticipated that expenditures will gradually increase through the early years of the program when habitats are becoming established and will taper off towards the end of the 18-year period. Production of game birds is

expected to peak during the mid- to latter part of the program and may exceed the equivalent of 20,000 birds during those peak years, averaging out over the entire program.

b. Annual administration costs (which will be higher during the early years of the program) shall not exceed 40 percent of annual expenditures.

c. Default by WDG will be identified by the Corps as the lack of progress in meeting program objectives. Minimum levels of program expenditures and habitat acquisitions must be met to achieve program objectives. Compliance with program objectives will be evaluated by the Corps at 3-year intervals. The expenditure criteria shall be set on the following 3-year schedule:

Year of Program	Expenditure Level
1989	$100,000 (includes administrative)
1992	$180,000
1995	$180,000
1998	$180,000
2001	$180,000
2004	End of program; all funds not expended must be returned to the Government.

If WDG is found to be underachieving a criteria level, they will have a maximum of 2 years to reach the desired level of expenditure. At the end of the 2-year "grace" period, all principal and accrued interest would revert to the Government if the criteria were not met. The extent of compensation remaining would then be accomplished by the Corps. Up to $30,000 above each criteria level may be accumulated for application to future years minimum levels. Thus, if $250,000 was spent 1 year, $30,000 would be credited to a future year to meet criteria if only $150,000 was spent.

5.03. ANNUAL REPORTS.

WDG shall submit annual reports to the Corps of Engineers, Chief, Planning Division, Walla Walla, Washington, 99362-9265, on or before 1 April of each vear beginning after the first year of funding and terminating at the end of the 18-year period. Each annual report will provide a complete overview of the program including fiscal information, site maps, hunter-use information, etc. Data will be provided on each farm site under the program. These data will include:

a. Location on a southeastern Washington base map (highlighting the sites acquired and deleted during the previous year).

b. Individual farm maps showing location of GFA developments, public access points, reader boards, and safety zones.

c. Ownership (farm manager).

d. Acreages of parcel open to public hunting and acreage of GFA development.

e. Type of hunter program.

f. Description of habitat developments under GFA lease.

g. Assessment of hunter use, harvest, and wildlife productivity of each site.

Each annual report will also include a summary of fiscal income (interest on account and remaining principal) and outlay (salaries, overhead, lease costs, development costs, and maintenance costs). The final annual report should provide a complete summarization of the 18-year program.

5.04. UNEXPENDED FUNDS.

Any funds (principal and accrued earnings) not expended by WDG at the end of the 18-year program period will be returned to the Corps of Engineers.

SECTION 6 - SITE DEVELOPMENTS

6.01. RECOMMENDED DEVELOPMENTS.

a. The 1983 study by Boe, et al. (Attachment A) recommended the following developments for establishing habitat:

(1) Plant nesting cover composed of alfalfa and alfalfa/grass mixtures on dryland sites.

(2) Fence creek bottoms and other noncultivated areas to eliminate grazing and protect from future habitat-damaging developments.

(3) Plant shrubs and trees in fenced areas where ground moisture is present and natural revegetation from fencing is not likely.

(4) Provide grass seed to farmers who will establish grass along waterways. Work with farmers in an effort to convince them to develop a terracing program on their cropland. Provide grass seed to them to establish cover on these terraces.

(5) In irrigated areas, lease strips of alfalfa to be left as nesting and renesting cover adjacent to permanent woody (riparian) cover.

(6) Establish cover on dryland areas between irrigated circles only under optimum conditions.

b. An example of a Game Farm Alternative (GFA) development plan is illustrated in Plate 2.

6.02. DRYLAND SITES.

a. Boe, et al. (1983) recommended planting strips of alfalfa or an alfalfa/grass mixture in areas where nesting cover is limited and where water and permanent cover currently exist. The variety of alfalfa should be Ranger or Ladak which are long-lived and adapted for nonirrigated environments. Strips should be located on bottom land or gentle, south-facing slopes. Exceptions should be made according to proximity to other cover and cost. Dimensions of the strips can be quite variable, ranging from a minimum of 70 feet to over 100 feet wide and from several hundred feet to over 5,000 feet long. Plantings are expected to be productive for a minimum of 10 years.

b. Forgoing the first and second cuttings but allowing cutting and baling the alfalfa by the landowner during normal third-cutting operations

will reduce the overall cost per pheasant and permit an occasional search of the sites to determine nesting use.

c. Sites should be drill-seeded in early spring at a rate of 15 pounds of alfalfa or 5 pounds of alfalfa and 10 pounds of grass per acre.

6.03. IRRIGATED AREAS.

Because of the high cost of developing this type of cover, it should only be considered in areas severely lacking quality nesting cover and where irrigated alfalfa will complete a comprehensive complex of habitat necessary for optimum production. However, the relatively high cost of bird production in irrigated alfalfa may be compensated for by the substantial acreage of land which may be opened to public hunting under this program.

6.04. DRYLAND AREAS BETWEEN IRRIGATED CIRCLES (CIRCLE CORNERS).

Although the circle corners evaluated during the study did not provide good nesting habitat, the use of these areas may be feasible under more optimal conditions (i.e., sites having adequate groundwater to support alfalfa). Also, inclusion of some circle corners may provide sufficient open hunting area to justify their use. It appears that additional experimentation will be needed to provide suitable habitat on circle corners.

SECTION 7 - LANDOWNER PROTECTION

7.01. TRESPASS SIGNING.

Fence signs to identify the property available to public hunting under this program will be supplied to the participating landowners. Lands open for public hunting under this program should be posted a minimum of 1 week prior to the opening of the general pheasant season. WDG project biologists will be responsible for ensuring that the signing of program lands is accomplished.

7.02. WEED CONTROL.

Weed control will be the responsibility of the participating landowner. However, it may be advantageous to the program if WDG performed the weed control where there is a concern that control measures proposed by the farmer may severely limit the usefulness of the habitat development. In either event, weed control should be approached cautiously when the wildlife habitat may be jeopardized.

7.03. LAWS AND REGULATIONS.

Federal, state, county, and local laws and regulations concerning fire protection, crop damage, and liability will be complied with by WDG.

7.04. ENFORCEMENT.

WDG will be responsible for enforcing laws pertaining to game violations. Trespass, vandalism, littering, and other civil offenses will be handled by the appropriate county sheriff's office. It is not anticipated that WDG will increase their enforcement staff in response to the implementation of this program.

7.05. LANDOWNER LIABILITY FOR HABITAT MAINTENANCE.

a. Participating landowners shall be responsible for maintaining the subject wildlife habitat areas on their properties in the intended functional state following successful establishment. Any loss of habitat resulting from the landowner's actions (mowing, disking, grazing, spraying, etc.) shall be replaced to the program at the expense of the landowner. This requirement should be clearly stated in the program agreements between the participating landowners and WDG.

b. Fencing required to protect habitat developments shall be installed as a habitat development cost to the GFA program (i.e., part of the $2,125,000 lump sum). Maintenance of such fences shall either be accomplished by the landowner or WDG, depending on the individual agreement reached between the two parties.

SECTION 8 - EVALUATION/MONITORING

8.01. GENERAL.

Monitoring of the habitat developments will be minimal to allow as much funding as possible to be spent on habitat development/maintenance and opening lands to public hunting. Evaluations of developments should be done through information acquired from routine monitoring visits to the sites by WDG project biologists. Decisions to abandon, rejuvenate, or enhance habitat developments should be the responsibility of the WDG project biologists using input from personal observations and discussions with landowners and hunters. Results of monitoring or evaluations of habitat developments by WDG shall not increase the funding level of the program from the Corps.

8.02. WDG MONITORING TECHNIQUES.

To obtain information necessary to prepare the program annual reports (see paragraph 5.03) and facilitate improvements in the program, WDG will utilize a variety of sampling techniques. These shall include but not be limited to postcard surveys, random hunter interviews and bag checks, landowner interviews, winter flush counts, and spring brood counts.

SECTION 9 - ENVIRONMENTAL ASSESSMENT

9.01. SCOPE.

The game bird farm alternative (GFA) program is a part of the overall LSRFWCP. GFA addresses ring-necked pheasant losses and other upland animal losses as well as their associated recreational values. The program will improve ring-necked pheasant habitat on land available for hunting. This section will discuss the environmental impacts associated with implementing this portion of the Compensation Plan. Compensation Plan measures were evaluated in the Final Environmental Impact Statement - Lower Snake River Fish and Wildlife Compensation, September 1976.

9.02. HABITAT DEVELOPMENT.

a. Physical Environment.

GFA causes very little impact on the physical environment. However, the process of soil erosion may be retarded by this program. The land developments to a certain extent will be similar to various soil erosion techniques. They will establish more vegetation on the land. This vegetation will help bind the soil together and protect it from the effects of wind and rain. Although this is an indirect beneficial impact, it may help slow soil erosion on adjacent agricultural lands. Soil erosion is a substantial problem in this region. Another aspect of the physical environment impacted by habitat development is construction materials. There would be a commitment of some construction material for the establishment of fencing. Overall, there are no significant changes in soil quality, water quality, air quality, or physical processes that are foreseen from implementing this program.

b. Biological Environment.

(1) There are minor changes concerning the biological environment. The vegetation of selected sites will be altered to enhance the production of game birds, particularly ring-necked pheasant. WDG may fence creek bottoms and other noncultivated areas to eliminate grazing and to protect from future disturbances. In addition, WDG may plant trees and shrubs in fenced off areas where ground moisture is present and natural revegetation is slow. Trees and shrubs likely to be planted are blackberry, Douglas hawthorn, Wood's Rose, honeysuckle, lemonade sumac, Rocky Mountain juniper, Russian olive, and Siberian pea shrub. The program may also increase grass establishment along waterways. Such grasses would probably be Sherman big bluegrass, Siberian wheatgrass, intermediate

wheatgrass, and smooth brome. These grasses, with mixtures of alfalfa, would also be used in dryland strips as well as for terracing on cropland. These habitat developments would create the possibility of Canada thistle, Russian thistle, cheatgrass, and tumble mustard establishing in protected or newly planted areas.

(2) There may be changes in the harvesting regime. The program may obtain strips of irrigated alfalfa which would be used for nesting habitat. These alfalfa strips should be adjacent to some permanent cover. The alfalfa crops would be left standing until the third cutting. This would alter the grade and/or amount of alfalfa produced on the affected cropland.

(3) Wildlife is the primary consideration in this program. The development is specially designed to increase wildlife production. The establishment of ring-necked pheasant nesting and cover habitat will increase the pheasant population in the area. Under this program, the pheasant population would increase as additional lands are added each year. The population growth would gradually peak as land is added to the program. Although designed to enhance pheasant populations, the establishment of new vegetation and the protection of existing vegetation from overgrazing will benefit other wildlife. Any invertebrate species, in keeping with their adaptability, should benefit. The vertebrates which share similar habitat requirements as the pheasant would also benefit. California quail, mourning dove, gray partridge and rabbit are other game species which should increase. During the test program, raptor usage of the test habitat developments was noted. Short-eared owls, sharp-shinned hawk, Swainson's hawk, northern harrier, and American Kestrel are raptors observed using these areas. Smaller nongame bird species such as song sparrow, American goldfinch, western meadowlark, and others would also use the areas. Small mammals such as mice, shrews, voles, and weasels should inhabit these new areas. As they become vegetated, the protected riparian or woody draw areas may provide some habitat for white-tailed deer.

c. Cultural Environment.

(1) The cultural environment will be impacted by habitat developments. Minor land use changes will occur concerning grazing and agriculture. With regard to agriculture, the cropland pattern will be altered by the delayed harvest of alfalfa. Fencing will reduce grazing in the riparian or woody draw areas. Neither of these land use changes result in significant changes to land use in the region.

(2) There is only one area of human interest that may be involved with the development of the project. The southeastern Washington

9.05. ENVIRONMENTAL REVIEW REQUIREMENTS.

The following paragraphs address the principal environmental review and consultation requirements applicable to Federal actions. Pertinent Federal Statutes, Executive Orders, and Executive Memorandums are included.

a. Federal Statutes.

(1) Reservoir Salvage Act of 1960, As Amended; National Historic Preservation Act of 1966, As Amended; Executive Order 11593, Protection and Enhancement of the Cultural Environment, 13 May 1971.

Cultural resources clearance will be required for all new development sites as they are identified. Selected areas will be surveyed/tested by a qualified archaeologist to determine if cultural properties are present. Consultation and clearance on all proposed cultural resources actions will also be obtained from the State Historic Preservation Office. Potential development sites will not be approved until cultural resources clearance has been obtained.

(2) Clean Air Act, As Amended.

Pursuant to Section 176(C) and 309 of the Act, Environmental Assessments will be coordinated with the Environmental Protection Agency.

(3) Clean Water Act.

This Act is not applicable.

(4) Endangered Species Act of 1973, As Amended.

The Fish and Wildlife Service concurs with the evaluation that no threatened or endangered species will be significantly impacted by the proposed action.

(5) Fish and Wildlife Coordination Act.

Coordination with the fish and wildlife agencies has been ongoing with the proposal through Corps of Engineers and Washington State agencies. The Environmental Assessment will be sent to the agencies for comment and we will continue working with them on this proposal.

(6) National Environmental Policy Act.

The environmental assessment for this proposal was prepared for circulation to public agencies and the general public. A Findings of No Significant Impact has been signed and a copy follows this Environmental Assessment.

(7) Wild and Scenic Rivers Act.

This Act is not applicable.

(8) Regional Power Act.

This proposal is part of the operation of the Lower Snake River Fish and Wildlife Compensation Plan. During the planning function of this proposal and at each relevant stage of the decision making process, we have considered and implemented the requirements of Section 4(h)(11) of the Pacific Northwest Electric Power Planning and Conservation Act (Regional Power Act). The possible rivers and creeks are in the Columbia River System and are therefore consistent with the Act's purposes and the Corps responsibilities thereunder.

b. Executive Orders.

(1) Executive Order 11988, Flood Plain Management, 24 May 1977.

This proposal will comply with the intent of this Executive Order.

(2) Executive Order 11990, Protection of Wetlands, 24 May 1977.

This proposal will comply with the intent of this Executive Order.

c. Executive Memorandums.

(1) CEQ Memorandum, Analysis of Impacts on Prime and Unique Agricultural Lands in Implementing NEPA, 11 August 1980.

No impact to prime or unique farmlands is expected to occur.

(2) CEQ Memorandum, Inventory Consultation to Avoid or Mitigate Effects on Rivers in the Nationwide Inventory, 10 August 1980.

No river on the inventory is expected to be adversely impacted by this proposal. We will coordinate with the appropriate agencies should any listed river be involved.

FINDING OF NO SIGNIFICANT IMPACT

GAME BIRD FARM ALTERNATIVE
LOWER SNAKE RIVER FISH AND WILDLIFE COMPENSATION
SOUTHEASTERN, WASHINGTON

The game bird farm alternative (GFA) will develop and maintain wildlife habitat to produce game birds. The amount of wildlife production will be equivalent to the game bird farm releases originally proposed (20,000 game birds annually). The Corps of Engineers and the Washington Department of Game support the proposed change. Habitat development is being constructed and operated under the Lower Snake River Fish and Wildlife Compensation Plan. In 1980, the Washington Department of Game recommended to the Corps of Engineers that a 3-year study be accomplished to investigate the feasibility of producing an equivalent amount of game birds through the establishment of habitat developments on privately owned farms in southeastern Washington. Those farms would provide public hunting as part of the program.

Construction and recreation impacts at the proposed sites are addressed in the program's environmental assessment. Primary impact of this program would be the increase of ring-necked pheasant populations in southeastern Washington. Moreover, other game and nongame animals will also benefit from the habitat developments. As the ring-necked pheasant population rises, the prey and predator animals associated with the pheasant would also be impacted. The program would also establish new vegetation and preserve riparian and woody draw habitats. As a result of this program, hunters in southeastern Washington should experience greater recreational quality and more recreational opportunity.

The GFA program has received ongoing coordination with concerned state and Federal agencies and the public. In view of the information provided by these sources and the environmental assessment evaluation, I find that the program would not result in significant impacts and that an environmental impact statement is not required.

DATE: 14 OCT 1986

James B. Royce
Colonel, Corps of Engineers
District Engineer

SECTION 10 - COMPENSATION COSTS

Costs of habitat improvements will vary on a case-by-case basis as negotiated between WDG and the individual landowners. Costs will also vary depending on the improvements required on a particular parcel (parking area, fencing, etc.). Minimal expenditures for improvements will allow acquisition of a greater number of acres of habitat and public access. Total cost of the GFA program (including any game bird releases) will be $2,125,000 for the 18-year period as shown in the following table:

TABLE 1

COST ESTIMATE

Item	Cost
1. Compensation to Farmers for Habitat Development	$1,770,833
2. Washington Department of Game Supervision and Administration (20%)	354,167
TOTAL COST	$2,125,000

SECTION 11 - DISCUSSION

This Design Memorandum has been prepared to describe the GFA program which will supplant the game bird stocking requirements described in the LSRFWCP. The Corps will provide a lump-sum payment to WDG for the 18-year project life. WDG biologists will select appropriate farms on which to establish upland game habitat and enter into long-term agreements with the landowners following compensation negotiations. While the program is not expected to replace the goal of 20,000 game birds per year during the initial years, production should exceed that amount in future years. Not only will the developed and/or protected habitats provide increased game bird production, there will also be benefits from increased habitats and associated production and survival of deer, rabbits, raptors, songbirds, and other wildlife. Additionally, it is anticipated that thousands of acres of private lands will be available to public hunting through this program.

SECTION 12 - RECOMMENDATIONS

It is recommended that the criteria, concepts, and procedures outlined in this report be approved as the basis to proceed with habitat establishment on private lands with minimal game bird stocking in lieu of game bird stocking on project lands. This program shall fulfill the 20-year game bird stocking program outlined in the LSRFWCP.

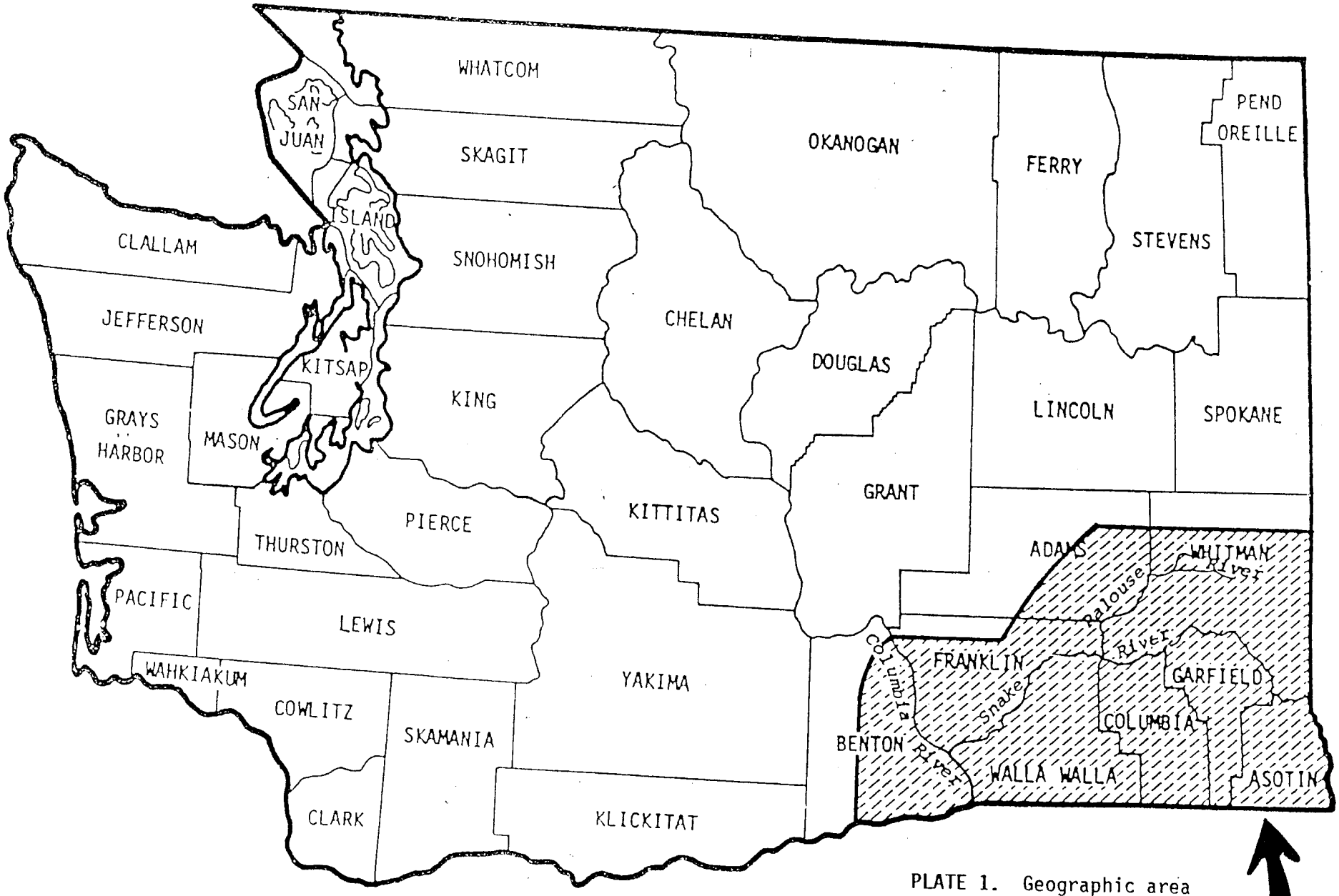
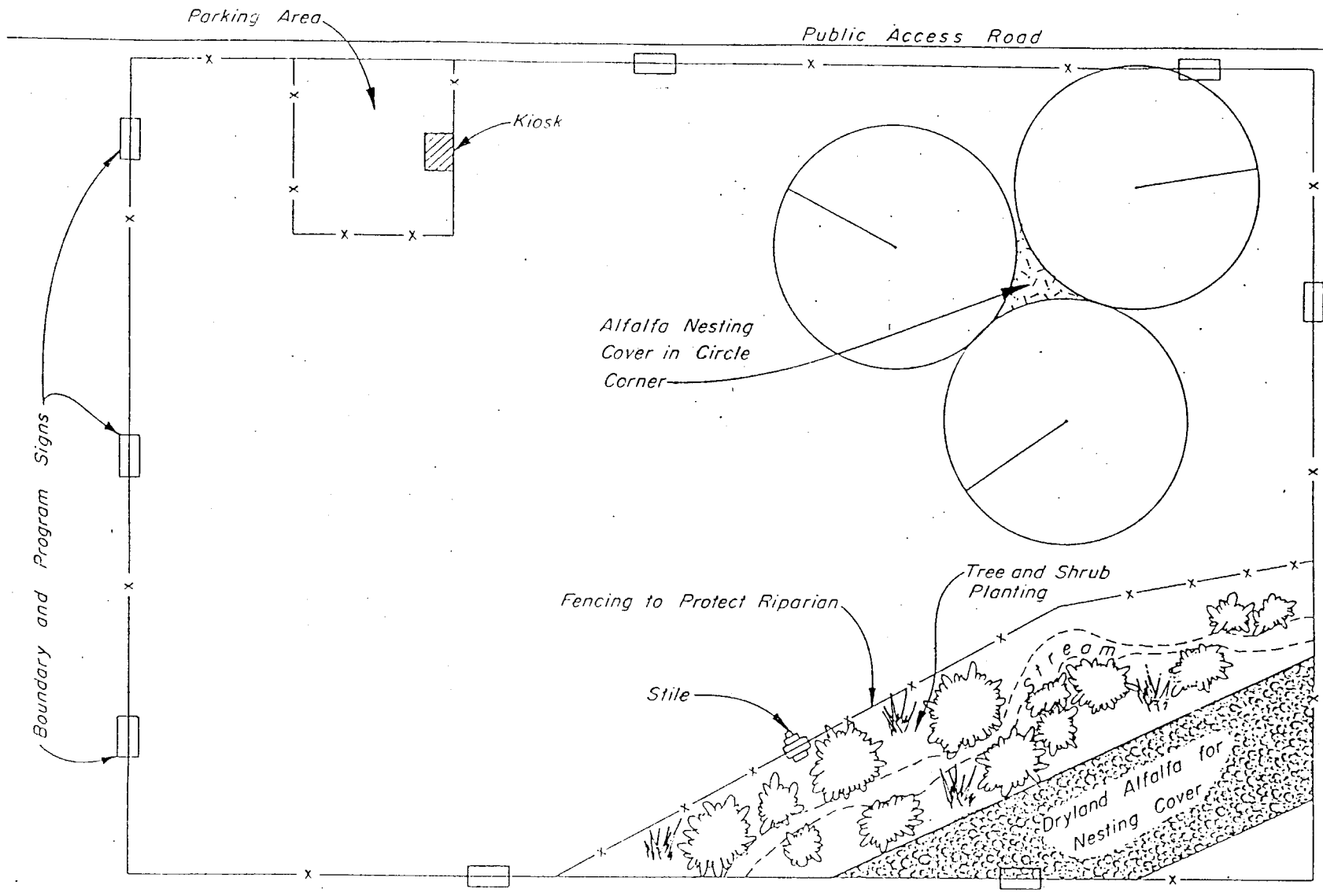


PLATE 1. Geographic area for Game Farm Alternative Program.

PLATE 1



LOWER SNAKE RIVER COMPENSATION PLAN
GAME BIRD FARM ALTERNATIVE
HABITAT DEVELOPMENT
CONCEPTUAL PLAN

PLATE 2 DM NO. **20**

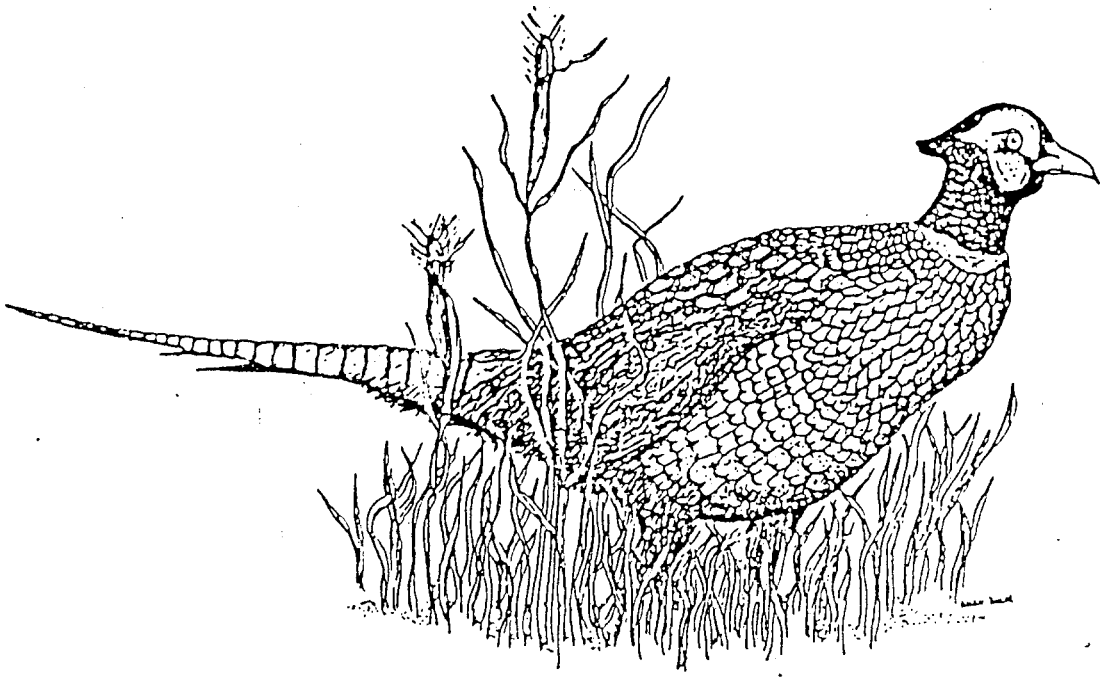
PLATE 2

ATTACHMENT A

GAME FARM ALTERNATIVE STUDY

ATTACHMENT

GAME FARM ALTERNATIVE STUDY



By

Lawrence Boe
Rocky J. Ross
David Mudd

Washington Department of Game

Final Report
30 September 1983

Prepared for
U.S. Army Engineer District, Walla Walla
Contract DACW68-81-C-0030

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ABSTRACT

The Washington Department of Game was contracted by the U. S. Army Corps of Engineers to undertake a three year pilot program to determine if it is economically feasible to produce wild, upland game birds by paying farmers to establish habitat on leased cropland. Concepts developed by Bagwell et al. (1979) involving irrigated cropland (delaying alfalfa mowing, raising the alfalfa mowbar, establishing perennial cover strips in the irrigated fields) were pursued with many landowners at the beginning of this study. In all cases either the landowners were not interested or the cost of the lease would have been prohibitive.

Additional habitat development concepts (dryland cover strips, unmowed strips of irrigated alfalfa, and establishing cover in circle corners) were examined by study biologists. These concepts and the overall design of the program were discussed with farmers in southeastern Washington. Those farmers willing to participate showed potential sites to study biologists. Criteria were discussed to determine acceptability of proposed habitat development sites. Following agreement between farmers and study biologists, leases were signed and habitat established.

The various habitat types were evaluated as nesting cover, brood cover, and prehunting season and winter cover. Hunting activity was monitored on farms enrolled in the program.

Upland game bird production was determined for each type of habitat development. Comparative costs for establishing habitat were then used to determine average cost per pheasant under the program. Costs varied from $33.19 per bird in irrigated alfalfa to $4.71 in dryland grass strips.

Economic benefits for the State of Washington were compared for game farm pheasants and those raised naturally under the program. Other benefits, both direct and indirect, were also examined.

INTRODUCTION

The construction of four dams (Ice Harbor, Lower Monumental, Little Goose, and Lower Granite) on the lower Snake River by the U.S. Army Corps of Engineers, Walla Walla District, resulted in the loss of 1123 acres of riparian habitat. This loss reduced the carrying capacity of the Snake River canyon for six species of upland game: mourning dove, California quail, ring-necked pheasant, chukar, gray partridge, and cottontail.

One of the goals of the Lower Snake River Fish and Wildlife Compensation Plan is to replace all of the upland game losses. Included in this compensation plan is the proposed release of 20,000 game farm birds per year for 20 years to serve as interim compensation until the wildlife habitat being developed along the river will produce birds naturally. Because of the high cost and logistical problems of releasing 20,000 game farm birds per year, a three-year pilot program (20 August 1980 to 30 September 1983) based on the "Matulich Plan" (Bagwill et al., 1979) was initiated to determine the cost-effectiveness of producing upland game by paying farmers to develop and/or maintain habitat on private farm lands. If found to be cost-effective this method of wildlife compensation may be used in lieu of some of the game farm birds.

This is the final report detailing results and recommendations.

OBJECTIVES

1. Measure success of game farm alternative pilot program. Determine production, pre-hunting season populations, and overwintering populations, attributed to the program.
2. Compare the cost of game produced on game farm alternative lands to game farm birds.
3. Compare public use of habitat development areas (game farm alternative areas) with private lands not enrolled in the program.
4. Estimate the amount of interim compensation provided by the game farm alternative pilot program. Compare hunting opportunity compensated by the program with hunting opportunity compensated by release of game farm birds.
5. Identify potential problems associated with a full scale game farm alternative program. Determine likelihood of farm operator acceptance of a full scale program.
6. Recommend continuation or discontinuation of the program. If continuation is recommended, recommend the level of funding needed.

DEFINITION OF STUDY AREA

The study was conducted in five counties adjacent to the lower Snake River (Columbia, Garfield, Franklin, Walla Walla, and Whitman).

METHODS

Before contacting farmers, we conducted a literature search, discussed problems

in upland game management with biologists in Washington and other states, and made decisions on the direction of the study. Programs designed to increase pheasant populations have concentrated on establishing some type of permanent cover. Because of limited time (three years) and the need to document production resulting from habitat development, we decided to concentrate on establishing quality nesting cover.

Many biologists from wildlife agencies and the literature generally concurred with the opinions of Baxter and Wolfe (1976) that loss of nesting cover is the greatest obstacle to overcome when attempting to increase pheasant populations within their range. Both Baxter and Wolfe (1976) and Galbreath (1973) stated that pheasants are adapted for winter survival and that following a severe winter the species will again exceed its carrying capacity by virtue of a high biotic potential. Studies in Iowa, Minnesota, Nebraska, North Dakota and South Dakota during 1956-58 concluded that increased, undisturbed nesting cover created by the Soil Bank program was responsible for pheasant population increases ranging from 19 to 96 percent (Weigand and Janson, 1976).

By concentrating on nesting cover we did not dismiss the importance of woody cover. Sites selected for habitat development were chosen with regard to proximity of woody or forb cover.

Criteria were established for selecting study sites, sites were selected, and habitat was established on dryland sites in Garfield, Walla Walla, and Whitman counties and on irrigated sites in Franklin County.

Study sites were evaluated for production (nest searches), holding cover (brood counts, pre-hunting season flushing counts), and winter cover (flushing counts).

FARMER INTERVIEWS

Interviews were conducted with irrigators in Franklin and Walla Walla counties and with dryland farmers in Columbia, Garfield, Walla Walla, and Whitman counties.

Most farmers were initially contacted by telephone. Names were given to us by WDG personnel, Soil Conservation Service (SCS) personnel, and other farmers. Remaining contacts were made at SCS meetings, through Agricultural Stabilization and Conservation Service (ASCS) newsletters, or by stopping at farms. We asked each interested farmer about crops, livestock, abundance of game on his lands, history of hunter access, and ways in which he could participate in the program.

STUDY SITE SELECTION AND HABITAT ESTABLISHMENT

The following criteria were established for selecting study sites:

1) The site had to be suitable to develop nesting cover.
2) The site should be away from buildings and near the edge of a field.
3) Strips were preferred to blocks to achieve a higher density of nests per unit of area.
4) Grazing would not be allowed.
5) Public access for hunting and nonconsumptive wildlife recreation must be allowed
6) Distance to water during the nesting season (March through June) and to winter cover (trees, shrubs, or tall forbs) could not exceed one-half mile.

7) Once established, the habitat was not to be altered to make it unusable for wildlife without our approval.

Using these criteria we determined if potential sites were acceptable. Following agreement with the farmer on cost, location of site, type of cover to be planted, and type of hunting program; a lease was signed and notorized. Cost of the lease was based on the farmer's estimate of profits lost through retiring crop land plus the cost of planting wildlife cover.

Dryland

Habitat was established on twelve dryland sites in Garfield, Walla Walla and Whitman counties. Five sites of various configurations were seeded to a mixture of alfalfa and grass between March and May of 1981. Three strips were seeded to alfalfa during the same time period. Two other sites comprising 12,000 feet of terraces were seeded to grass in the spring and fall of 1982. Cover on those sites originally existed as sparse annual weeds and volunteer wheat. We attempted to improve the cover and increase upland bird nesting on those terraces. Ladak was the only variety of alfalfa used. Grass species included Sherman Big Blue grass, Smooth brome and intermediate wheatgrass.

We also studied an existing fence row and grass waterways on two additional sites at no cost to the study. The grass strips on these sites varied from two to 50 feet and increased our sample for dryland study sites.

Seeding rates on all sites were 15 pounds of alfalfa per acre, five pounds of alfalfa and 10 pounds of grass per acre, or 10 pounds per acre of grass alone. One farmer included about five pounds of spring barley per acre with his alfalfa/grass mixture (Table 3).

All sites varied in size, shape and dimensions. Some were over 200 feet wide and up to 8,500 feet long. Several sites were small acreages separated from a larger field by a creek or a patch of shrubs on a hillside making them inconvenient to farm. Locations included north and south-facing slopes, bottom land and hill tops. Areas varied in size from less than one-half acre to over five acres. Average annual precipitation on all sites ranged from 14 to 23 inches.

Irrigated

We evaluated twelve sites including unmowed strips of alfalfa, corners of fields under center pivot irrigation, and corn (standing and stubble).

Four sites consisted of alfalfa strips which were left unharvested until the third cutting. We tested strips of 10, 20, 30 and 40 foot widths. All strips were approximately 100 feet long. Pairs of each width were tested; one near the edge (within 50 feet) and the other near the center of each field. These strips were staked prior to the first cutting and were evaluated as nesting cover. The alfalfa was mowed and baled during normal third cutting operations to remove the cover and permit a more accurate nest search.

We evaluated irrigated alfalfa strips during all three years of the study. Different width strips were tested in each field each year.

Another four sites consisted of leased corners adjacent to center pivot irrigation systems. On four farms we leased a total of nine corners for a total of 23.2 acres. On eight corners we planted dryland alfalfa or mixtures of dryland alfalfa, grass, and winter wheat or spring barley. The remaining circle corner had been established to dryland alfalfa in September 1979 and was leased to study as nesting and holding cover. Seeding rates per acre were 15 pounds of alfalfa, or, two pounds of alfalfa, four pounds of grass, and nine pounds of wheat or barley. All corners were disced prior to planting to eliminate competition.

Four attempts were made to establish cover on these sites. Those involved in the work included farmers, a Game Department Habitat Specialist, and the combined efforts of a Columbia Basin Irrigation Conservationist and a Game Department study biologist.

Irrigation was necessary to establish the plantings but was difficult to arrange. Attempts were made to irrigate the corners at least once following each planting using a watering truck, a portable irrigation pump with handlines, or handlines tapped into adjacent farmers' mainlines. We were unable to obtain the necessary equipment to irrigate some sites. On other sites we were able to irrigate at up to 12 hours per set.

The remaining four sites consisted of corn and were studied as winter cover. We conducted flushing counts on a total of 205 acres of corn (both standing and stubble) in January and February of 1982 and 1983.

Nest Searches

Nest searches were conducted on all dryland sites between 15 April and 28 July 1981, between 11 June and 16 August 1982, and between 20 June and 10 September 1983. Each site was searched twice with a revisit if an active nest was found on the second visit.

Controls of similar configuration and area were located in the same field or an adjacent field which was cultivated in a similar manner. Controls on dryland sites were searched following harvest to minimize crop damage.

All irrigated study sites were searched between 28 May and 5 September 1981, between 15 August and 6 September 1982, and between 10 June and 26 September 1983. Controls on irrigated sites were searched at the same time as study plots in 1981, 1982, and 1983.

Searches were conducted by one to four biologists proceeding slowly and abreast of each other. We attempted to search every square foot of the study sites and controls. All bird nests found on the sites were counted. Data were collected on species, nest success (a nest in which at least one egg hatched), hatching success, cause of mortality, distance to nearest edge, distance to water, and width, height, and species composition of vegetation.

Brood Counts

Brood counts of upland game birds were conducted between 1 June and 15 September

during 1981, 1982 and 1983. Study and control sites were searched and all species of upland game birds were counted. Data gathered included number of hens (pheasants) or adults (quail and partridges), number of juveniles (all species), and age of juveniles (pheasants).

Pre-Hunting Season Flushing Counts

Flushing counts were conducted prior to the opening of the general hunting season. Counts were conducted once in 1981 by one biologist and three times in 1982 by one to three biologists with two bird dogs. Counts were conducted between 17 September and 9 October 1981 and between 12 September and 8 October 1982. Birds were flushed and counted by species and sex if possible.

Winter Flushing Counts

Flushing counts were conducted between 5 January and 23 February 1982 and between 11 January and 24 February 1983. Counts were conducted by two or three biologists with one or two bird dogs. Study sites and controls were searched three times. All birds flushed were counted.

Monitoring Public Access And Hunter Success

One of the requirements of farmer's participation in our study was that he allow public hunting. This requirement was satisfied by enrolling in one of the Department's hunting programs: 1) Feel Free to Hunt; 2) Hunting by Permission Only; and 3) Hunting by Written Permission.

In 1981 farmers were asked to distribute postcard questionnaires, one to each hunting party using his land (Appendix A). The postcard contained questions about the present hunt and the previous hunt. Before the start of the hunting season, we distributed 20 postcards to each farmer (except the three farmers enrolled in the Feel Free to Hunt program). The postcards were stamped and addressed to Snake River HMA, Pasco.

In 1982 we placed postcard questionnaires on reader boards at each study site in the Hunting by Permission Only program.

Hunter use data was collected by Habitat Specialist Rich Phillips on four farms in Franklin County. These farms were enrolled in the Feel Free to Hunt program before participating in the study. We also gathered data on hunter use and hunting success from farmers' recollections and by randomly monitoring the sites.

Interim Compensation

Interim compensation is based on the estimated number of game bird eggs hatched on study sites financed by the program less the number of eggs hatched on control sites. Other compensation such as winter use by game and nongame birds and deer use are incidental to the program. Data on such use is presented but is not assigned a dollar value.

We were not able to accurately count the number of eggs hatched in all nests found. To simplify analysis and for consistency we used clutch size data from other studies (Table 1). These studies had large sample sizes which provided us with useful data. For example, rather than estimate the number of eggs hatched in an nest we assume all successful dryland pheasant nests contained 13 eggs of which 12 hatched.

Because of different clutch sizes for successful pheasant nests in dryland and irrigated study areas, compensation is divided into dryland and irrigated parts of the program.

Table 1. Number of eggs per clutch for game birds likely to nest on study sites, Game Farm Alternative Study, 1982.

Species	Average Clutch Size	Source
Mallard	11	Harrison, 1978
California quail	15	Leopold, 1977
Ring-necked pheasant (early nest)	13	Knott, et al., 1943
Ring-necked pheasant (renest)	8	Baxter and Wolfe, no date
Gray partridge	17	Knott, et al., 1943

Comparing Benefit To Cost

A comparison was made between the net economic benefits to the State from game produced through habitat manipulation and game farm produced birds. To determine the value and economic benefits of wild upland game, formulae were used which incorporated information on man-days, expenditures required to harvest each species, and expenditures for non-consumptive recreation.

RESULTS AND DISCUSSION

Farmer Interviews

We interviewed 178 farmers, and 72 (40 percent) expressed interest in participating in the study. There is still a considerable number of potential participants available in the five county area (Table 2).

Table 2. Results of interview with farmers conducted between 30 August 1980 and 15 July 1983 and numbers of farmers in study area, Game Farm Alternative Study.

	Counties in Study Area				
	Columbia	Franklin	Garfield	Walla Walla	Whitman
No. of Farmers Interviewed	20	49	15	34	60
No. of Farmers Interested	7	22	7	15	21
No. of Farms[a] in Study Area	220[b]	700[c]	120[b]	180[b]	1,100[b]

[a] Numbers were obtained from SCS office in each county and are approximate.

[b] Numbers of farms where average annual precipitation exceeds 14 to 15 inches, the minimum amount needed for successful dryland cover plantings.

[c] Number of farms which are irrigated.

Response to the program ranged from enthusiasm and willingness to cooperate immediately to a completely negative attitude towards upland game. Not all interested farmers were willing to participate immediately; most asked for time to consider.

Fewer than half of the uninterested farmers expressed a completely negative attitude. As attitudes change, it is likely that some farmers who expressed interest will desire not to participate, and some farmers who were negative will express interest.

Many farmers believe the presence of wildlife on the farm adds to the quality of life and enjoy sharing their experiences and knowledge of wildlife. In dryland areas they equate the abundance of upland game with farming practices. Farmers realized that establishing grass waterways and retiring steep slopes from cultivation increases habitat which may increase upland game bird populations. Conversely, farmers realize narrowing or eliminating fence rows and grazing streambanks reduces habitat and probably wildlife populations. Irrigators consider the destruction of nests and hens during alfalfa mowing a significant obstacle to pheasant survival.

Each farmer had his individual concerns about establishing upland game habitat, and no two responses were exactly alike. Common concerns among dryland farmers were crop history, weeds, and hunting. Agricultural Stabilization and Conservation Service (ASCS) crop adjustment programs base their benefits on the amount of land a farmer normally cultivates. Thus, to maximize future benefits, most farmers cultivate as much land as possible. This results in situations as in Whitman County where 97 percent of the arable ground is cultivated (Dennis Roe, SCS, Whitman Co., 1980, pers. comm.). Many farmers (especially those buying or leasing) do not want to reduce their crop acreages, even by a small amount. Potential weed infestations, especially cheat-grass and Canada thistle, deter some dryland farmers. They believe creating habitat would provide a source of weed seeds to invade adjacent cropland.

Farmers with irrigated land commonly voiced concerns over weeds and neatness of their farms. Irrigators were not so concerned with cheat-grass as dryland farmers, but were worried about potential infestation of habitat plots by Canada thistle, Russian thistle and tumble mustard. Several irrigators stated that the reason they chose not to enter our program was because it would ruin the well groomed look of their farms.

A few farmers in both dryland and irrigated areas expressed concern over the anticipated increase in pheasant populations. To them, more pheasants mean more hunters, an undesirable situation.

Some farmers were concerned that hunting would severely reduce or eliminate upland game on their lands. They generally were unaware of the high average annual turnover rate in naturally regulated populations of approximately 70 percent (Weigand and Janson, 1976) or of the birds' high biotic potential (Table 1). From these contacts we learned that, although farmers observe game birds throughout the year, as a group they can learn more about the biology of upland game. We believe we did alter some attitudes and opinions regarding habitat needs and hunting as an influence on bird populations.

Irrigators in Franklin and western Walla Walla counties expressed the opinion that leasing irrigated cropland for habitat based on the proposals of Bagwell et al. (1979) would be too expensive, and some corn growers complained of crop damage from pheasants during planting. They did not want a larger pheasant population which might increase crop damage.

Despite the negative aspects of creating upland bird habitat, enough dryland farmers expressed interest to provide us with a pool from which to select study sites.

In irrigated areas we had far more difficulty in getting alfalfa growers to participate. These problems will be discussed later in the report. We interviewed each interested farmer more than once before deciding which farms would proceed with habitat development. Some potential participants later declined to participate when they decided our criteria pertaining to development, payment, or pubic access did not fit their needs. Our opinion is these farms and many who first expressed a negative oninion should be contacted again if a full-scale program is implemented.

STUDY SITE SELECTION AND HABITAT ESTABLISHMENT

Dryland

Our original goal was to establish strips ranging from about six to 25 feet wide composed of an alfalfa/grass mixture to learn which width of strip is most cost-effective in producing successful nests. As each farmer presented his site we discussed criteria which would determine if the site was acceptable.

We quickly learned that each farmer had his own set of criteria for cooperating in habitat development, and we needed to remain flexible. Every farmer insisted that he must be permitted to spray for noxious weeds, especially Canada thistle. And, alfalfa could not be planted on terraces as it attracted burrowing mammals.

Every farmer who showed us a site knew the productivity of the ground. Prices quoted to us based on average annual profit were later presented to SCS personnel. The prices were considered reasonable estimates of taxable income over the last several years and ranged from $50 to $100 per acre.

Following agreement of the location of the site, cost of the lease, habitat composition, method of planting, and hunting program a lease was signed by both parties and notorized. Appendix B is an example of a signed lease for a dryland study site. Table 3 presents data on the dryland study sites selected.

Establishing habitat on dryland sites depended on when the farmer was able to get to the site with his equipment. Our program ranked low on every farmer's list of priorities. Preparation of seed bed and planting were done after other greater income-producing areas of the farm had been dealt with.

The following are brief descriptions of the study sites.

Some of the sites (Harvey and Pettibone, terraces and waterways) are comparable to wide fence rows. Sites on the Koenig, Marler, and Robison farms are bottomland adjacent to trees and shrubs with a creek nearby. And, sites on the Carter and Repp farms resemble eyebrows on north-facing slopes. Most of the sites were planted in April or May of 1981.

Mr. Koenig's site was planted in March 1981. The alfalfa emerged but froze out. Had we planted in May the alfalfa probably would have survived. The site became dominated by a mixture of annual weeds which provided good cover during the autumn and winter but poor nesting cover.

Mr. Koenig cultivated the site in May 1983 and reseeded it to alfalfa at 15 pounds per acre. In early July he mowed the site to reduce competition from annual forbs. By late July the stand of alfalfa looked very good. In the spring of 1984 this site should produce high quality nesting cover.

Approximately 85 percent of Mr. Repp's site was broadcast seeded which resulted in a stand of alfalfa with a thick canopy. The remainder of the site was drilled with alfalfa seed. This seeding method resulted in a higher basal density of plants than did the broadcast method. The strip of yellow sweet clover seeded down the center of the site produced a dense stand of excellent cover.

Grass is becoming more noticeable on the sites in which it was included and will eventually dominate the sites in years to come. Grass seedings on terraces essentially failed. In the future, we recommend all sites be seeded with a drill.

We had no success in finding farmers willing to plant anything but grass in waterways. They felt that both aerial and ground spraying of adjacent fields with broadleaf herbicides would kill or severely inhibit alfalfa or any other broadleaf planting. Farmers had a variety of reasons for wanting or not wanting to plant certain mixtures. On this point we had to be flexible and be willing to accept farmers' decisions, provided the mixture would provide good nesting cover.

Waterways which we propose to help finance would be primarily intended for erosion control if we do not get involved. They would be cost-shared by the farmer and ASCS. We propose to provide the seed which is the least expensive part of waterway establishment. For this cost we ensure that grass species which are good nesting cover are planted and expect the farmer to take greater precautions to protect the cover during critical times of the year for wildlife.

Table 3. Dryland habitat study sites.

Farmer	Habitat Data									
	Area in Acres	Conf.[a]	Length in Feet	Width in Feet	Composition	Date Planted	Cost per Acre per Year	Total Cost per Year	Cost to Plant	Precipitation in Inches
Harvey 1	4.0	St	2,960	65[b]	Alfalfa	May 79	$ 75	$300	--	21
Harvey 2	5.0	St	3,140	70	Alfalfa/Grass	May 81	75	375	$ 87.49	20
Koenig	3.0	Bl	600	220[b]	Alfalfa/Grass	May 81	100	300	312.75	23
Marler	1.2	Tr	360	145[b]	Alfalfa/Grass	May 81	100	120	34.00	22
Pettibone	5.8	St	8,450	30	Alfalfa	May 81	100	580	180.00	20
Repp	3.0	Tr	600	220[b]	Alfalfa/Grass/[c] Sweet Clover	June 81	70	210	100.00	16
Morgan[e]	2.3	Te	9,000	10[b]	Grass	Apr 82	--[f]	--[f]	45.00	16
Murray[e]	2.0	Te	3,500	30	Grass	Apr 82	--[f]	--[f]	40.00	16
Carter	2.5	St	1,100	50	Alfalfa/Grass	May 81	--[g]	--[g]	--[g]	14
Robison	5.3	St	4,850	90	Alfalfa	Apr 81	--[g]	--[g]	--[g]	16
Culbertson[d]	3.2	W	4,480	30[b]	Grass	1962[i]	--[f]	--[f]	--	17
Hagedorn[h]	0.2	F	2,400	4[b]	Grass	1965[i]	--[f]	--[f]	--	23

[a] Configuration; St= strip, Bl= block, Te= terrace, W= waterway, F= fence row, Tr= triangle

[b] Width varies; figure represents mean.

[c] A strip of yellow clover (20 feet by 500 feet) was seeded down the center to provide winter cover.

[d] Existing grass waterways.

[e] Terraces, only cost involves seed.

[f] No lease involved.

[g] Habitat established at farmer's expense.

[h] Existing fence row.

[i] Approximate year.

The terraces on both the Morgan and Murray farms were covered with sparse stands of annual weeds and volunteer wheat in 1981. Mr. Morgan's farm has five terraces totalling 9,000 feet. Mr. Murray's farm has three totalling 3,000 feet. In 1982 we made two attempts (spring and fall) to establish quality grass cover on all the terraces. Both attempts failed. We feel this was because the sites were broadcast seeded rather than drilled. We believe that by establishing high quality grass cover on these terraces, we can increase nesting use by upland birds.

We had intended to establish alfalfa strips, grass strips, and alfalfa/grass strips in five different classes of widths (Table 4). However, we were not able to find farmers willing to establish certain widths and cover types.

Table 4. Vegetative composition and width and length of dryland study sites.

	Width in Feet				
	0-10	10-25	25-50	50-100	100+
Alfalfa	0	0	9,300[ab]	5,100[a]	1,900[a]
Alfalfa/Grass	0	0	600[b]	3,600[b]	1,600[a]
Grass	2,400[a]	1,600[ab]	2,300[ab]	100[b]	0

[a] Discontinuous, more than one site.

[b] Includes sites with more than one category of width.

Irrigated

Bagwell et al. (1979) estimated the hypothetical costs of producing pheasants in irrigated crop land in the Columbia Basin. They believed that cover strips along the edge of fields would be the most cost-effective followed by raising the alfalfa swather mow bar 10 inches, delaying alfalfa mowing one to three weeks, and retaining corn stubble as winter food supply. Their work became the stimulus for this study.

We pursued agreements with irrigators along the lines of the above examples. We interviewed farmers who grew alfalfa hay, alfalfa seed, apples, asparagus, barley, beans, cabbages, carrots, cherries, clover seed, field corn, sweet corn, onions, potatoes, radishes, turnips, and wheat.

We investigated the establishment of several types of cover strips including winter wheat in a circle of salad vegetables, grass/legume mixtures along the edge of a circle, and unharvested asparagus.

Leasing irrigated land costs $200 per acre for electricity and water. Because of the large investment, irrigators grow crops on every acre of land they can efficiently water.

On Nedrow Farms in Walla Walla County we pursued the possibility of leaving winter wheat strips 14 feet wide on the windward side of a circle of vegetables.

Wheat is planted in the fall primarily to reduce wind erosion and as green manure. In spring the wheat is disced under and strips of vegetables are planted perpendicular to the prevailing winds. We proposed to leave at least two 14-foot wide strips of wheat remaining. The wheat would have acted both as nesting cover and wind break, and would later be harvested. The cost for this type of program would have been $100 per acre. Foster and Tillett (1977) found a pheasant nesting density in irrigated wheat of one nest per six acres, resulting in a cost of $600 per nest. We did not have a chance to pursue this further as Nedrow Farms did not plant vegetables the following year. This aspect of the program did not appear to be cost-effective.

With regard to other types of cover strips (e.g., asparagus, corn, legumes) farmers told us it would be too expensive to consider and not worth their effort. For example, field corn produces an income of $450 per acre. Our best hope for this aspect of the program would be if State or Federal legislation required the reduction of wind erosion. This would require wind breaks such as asparagus strips in fields which would also provide upland game bird cover.

We asked every alfalfa grower we interviewed about the feasibility of either delaying mowing of alfalfa to allow more nests to hatch or raising the swather mowbar 10 inches to pass over nesting hens. All opposed delayed mowing and only two considered raising the mowbar. One of the problems with delaying mowing is setting the date on which the first cutting is to be made. It is unlikely alfalfa to be cut as hay will be ready on the same date each year.

We presented alfalfa growers the following hypothetical situation: if you had a contract with WDG to take your first cutting no earlier than 1 June, and your hay was at 10 percent bloom (optimum harvest conditions for many growers) on 15 May, would you wait until 1 June to cut? Every grower answered no. Just as the peak of game bird hatching varies from year to year, so does the optimum date for taking the first cutting of alfalfa.

If an alfalfa grower had a 40-acre field in which he delayed mowing, he could possibly be left with 120 tons of feeder grade hay which would be difficult to sell. Even if we paid the farmer the expected difference in price of $25 per ton or $3,000 for the field, he still would have to sell the hay to make a profit.

Lack of landowner interest in this aspect of the program precludes it as a viable option.

We received only two positive replies from alfalfa growers on the subject of raising the mowbar approximately 10 inches to pass over nesting hens. Both farmers mentioned they had once seen a nesting hen and raised the mowbar enough to pass over her head. Both hens flushed after the mowbar passed overhead and one later returned to the nest and hatched a clutch even though she was easily detectable in the field.

Several problems surfaced in the discussions of this harvest variation. First, the mowbar would have to be "floated" over the field at the 10-inch height rather than allowed to ride on the ground. Irregularities in the level of the field would require continuous adjustment of the mowbar or would cause the level of the cutting to differ. Second, a certain percentage of the nests would be either crushed by the tires or covered by the windrow. We observed an International Harvester swather being used and determined that 22 percent of the 13-foot wide swath was covered in this

manner. Finally, the first cutting would be high quality hay, but the second cutting would contain a high percent of stems which degrades the quality.

We considered alfalfa the only irrigated crop to be economically practical to work with, and continued to pursue ways in which to work with alfalfa growers.

As a means of providing re-nesting cover in alfalfa fields, we asked growers if they would be willing to test the use of uncut alfalfa as re-nesting cover. In 1981 we found three farmers willing to leave strips of alfalfa until the third cutting at which time they could cut the hay. The date of the third cutting varies in Franklin and Walla Walla counties from about 10 August to 10 September. Each farmer was willing to leave two strips of the same width (one near the edge and one in the middle) uncut until the third cutting. We tested widths of 10, 20, 30, and 40 feet. A length of 1,000 feet was tested in all but one field. The strips ranged in area from approximately one-quarter acre to one acre. The test was conducted in 1981, 1982, and 1983 and each field was left with different widths of strips each year (Table 5). Each field chosen had a history of pheasant nesting except Mr. Harris' which was planted the previous fall. Within a mile of this field were three other alfalfa fields in which pheasants had nested in 1980.

Table 5. Name of participating farmers with irrigated alfalfa strips tested as re-nesting cover, 1981-1983.

	Widths of Strips in Feet			
Year	10	20	30	40
1981	Winebarger	Bailie 2	Harris	Bailie 1
1982	Bailie 1	Lye	Bailie 2	Harris
1983	Harris	Bailie 2	Bailie 1	Morgan

Studies of nesting in irrigated alfalfa differ in their interpretation of the phenomenon of edge. Galbreath (1973) found the greatest densities within 100 feet of the field edge; whereas, Nelson et al. (1959) found nests to be randomly distributed. We located the outer strip approximately 50 feet from the edge. We felt this would be an optimum location to save some nests which were active during the first cutting.

The cost per acre to this program is a function of the reduced number of tons of hay harvested per acre and the reduction in quality of that hay due to late harvest. The agreed upon cost ranged from $165 to $200 per acre. If this aspect of the program is continued we recommend an offering price of $175 per acre. This would simplify negotiations and keep the offering price constant throughout Franklin County. The $175 figure is an average over the last several years and may change with the market.

Another aspect of our program concerns attempts to establish habitat on corners adjacent to center pivot irrigation systems. Irrigators in the Columbia Basin who have installed these systems have done so to reduce maintenance and labor costs. The initial investment is high, about $38,000 for a system that will

irrigate 130 acres, compared to about $12,000 for a wheel line system to irrigate a similar acreage.

A center-pivot system will leave approximately 10 to 16 acres unwatered in the corners. Providing water for the corners requires the use of hand lines, the type of labor intensive agriculture the farmer is trying to avoid. However, many farmers do irrigate their circle corners for one of the following reasons: 1) they do not like to see potential cropland not producing; or 2) they want a larger income, regardless if the profits on the corners are low. Farming activity on fallow corners usually consists of periodic discing to suppress weeds, especially Russian thistle.

In February 1981 we contacted three farmers who agreed to try establishing dryland alfalfa on their circle corners. We inquired whether dryland alfalfa will grow in the dry, sandy soils of the south Columbia Basin and received mixed opinions. Dryland varieties grow longer root systems than do high production varieties of alfalfa; an estimated 18 to 20 feet compared to five feet. Some farmers and biologists said dryland varieties would grow in the Basin but may thin out through competition.

We negotiated the cost of a lease with each grower and discussed how to establish the habitat. The cost of the leases on the Albin and Alford farms was based on taxes which are about $8 a year (Table 6). The cost of the lease on Bailie's Boys Ranch was based on taxes and the fee which the irrigation district charges for making water available. We feel we paid too much for the lease on the Boys Ranch, a result of our enthusiasm to get started and inexperience in negotiating. If future leases are pursued, we should not offer more than about $10 per acre.

Table 6. Corners adjacent to center-pivot irrigation systems to be managed as cover, Game Farm Alternative Study.

Farmer	Number of Corners	Area of Corners (acres)	Cost to Lease an Acre Per Year	Total per Year	Cost to Establish Cover Per Acre	Total Cover Over Three Years
Albin	1	3	$ 10.00	$ 30.00	$40.00[a]	$ 210.00
Bailie's Boys Ranch	3	10	50.00	500.00	25.00[b]	1,750.00
Alford	4	10	10.00	100.00	40.00[a]	700.00
Vogt	1	1.2	100.00	120.00	---[c]	320.00

[a] Cost is for ground preparation, drilling and seed.

[b] Cost is for seed.

[c] Alfalfa was planted in 1978.

After each lease was signed, the farmer disced the corners to eliminate competition and drilled the seed at 15 pounds per acre. The circles were planted in early March 1981 while the soil was moist. The seed germinated and appeared to be doing well. We tried to water the corners with a portable pump and tank truck to increase the chance of survival. Despite our efforts, we could not water the corners well enough to ensure survival. A severe wind in April (about 60 m.p.h.) destroyed the plantings.

Later in April 1981 we located a farmer (Mr. Vogt, Table 6) who had three circle corners supporting dryland alfalfa. The corners were planted by the previous owner in 1978. One corner in particular was producing a dense stand which can provide about 1½ cuttings versus three or four cuttings with irrigated varieties. The former owner recommended planting coated seed at a rate of 30 pounds in September. As long as the seedlings grow to the three-leaf stage before frost, the plantings might survive. Mr. Vogt leased this same circle corner (1.2 acres) to us at $120 per year. The corner lies adjacent to three circles of alfalfa.

In October 1981, we again attempted to established dryland alfalfa on the corners. On the advice of Jerry Benson (alfalfa grower) we planted at a rate of two pounds of alfalfa, four pounds of Siberian wheatgrass, and nine pounds of Steptoe barley. The corners on the Albin and Alford farms were planted in late October by the farmers. Siberian wheatgrass was included to provide diversity, and the barley was included to reduce dessication. Steptoe barley will winterkill; after it emerges in the fall and freezes, there is no more competition from it. The alfalfa on the circle corners did not survive the winter but the wheatgrass did. We believe the corners were planted too late in the fall, and the alfalfa germinated and winterkilled.

In March 1982 we re-seeded the corners on Bailie's Boys Ranch with the same mixture of alfalfa, Siberian wheatgrass, and barley. The corners were disced, the seed was broadcast and a harrow was dragged over the corners to work in the seed. This time we had the use of portable irrigation equipment. The equipment belongs to the South Columbia Irrigation District, Mesa, and is controlled by Soil and Moisture Technician Hugh McEachen. Mr. McEachen was interested in our program, as it related to his program involved with controlling wind erosion and providing competition for weeds.

Between 21 and 23 April 1982 we irrigated 10 acres on three corners of the Boys Ranch using a four cylinder, portable diesel pump and three and four inch hand lines. Each set lasted three hours and covered approximately two acres. Containers placed at random indicated water received varied from 3/4 to 1¼ inches.

Two neighbors whose lands are adjacent to the corners were contacted. One volunteered the use of four-inch risers and the other water from his ditch. We irrigated again in early May.

The three corners were also sprayed with 2-4D-B Amine to combat broadleaf weeds. Two gallons were applied using a portable tank and pump and a hand sprayer. Again the planting failed.

Between 11 and 20 October 1982, we disced, fertilized, packed, seeded, and watered the three corners (10 acres total) on Bailie's Boys Ranch. Again Mr. McEachen

provided a tractor, disc, drill, portable pump, and hand lines. Seeding took place later than the preferred date because this equipment was unavailable at that time. Twenty pounds of fertilizer were broadcast and 25 pounds of seed (10 Agate alfalfa, 10 winter wheat, 5 Whitmar beardless wheatgrass) were drilled.

One corner was watered using the portable pump, the other two by connecting into risers from adjacent farmers' irrigation systems. Both farmers gave us permission prior to watering. Eighteen sets were needed, each set lasting an average of 12 hours.

We have monitored the site and by July 1983 some of the alfalfa was still growing where there appeared to be adequate soil moisture. Basically this aspect of the program was a failure. We believe the successful establishment of dryland alfalfa on Mr. Vogt's farm was primarily a result of location. Where adequate soil moisture lies near the surface dryland alfalfa will survive. Despite the problems we have encountered, establishing cover on circle corners should not be totally disregarded.

If we can establish cover on circle corners, there will be times of the year in which they would provide a significant amount of available habitat, especially immediately following the first cutting of alfalfa.

NEST SEARCHES

Dryland

Peak hatching dates for pheasants in southeast Washington have been found to vary locally from 16 May to 28 June (Buss and Swanson 1950, Knott et al. 1943, Mudd et al. 1979). For the five county area in the southern part of Region One (Walla Walla, Garfield, Columbia, Asotin and Whitman), eight years of data indicate the peak date averages 11 June. It was around this date and late in the nesting season that we concentrated our nest searches. Tables 7, 8, and 9 present the data on the nests we found. No nests were found on control sites in 1981, 1982 or 1983.

Nests were found in the following locations:

The alfalfa strip on the Harvey farm (Strip 1) measured 3,000 feet by 65 feet. It was located on a south-facing hillside, and was bordered by cultivated fields. The cover was of high quality and comparable in density to irrigated alfalfa in Franklin County. In 1981 we found one game bird nest, a pheasant nest destroyed by magpies. We also found two short-eared owlets on 30 April which we assume hatched from a nest in the strip.

In 1982 and 1983 we asked Mr. Harvey to remove the hay to allow a thorough search. The hay was cut and baled in mid-July both years. Before removal we found no nests or little indication of pheasant or partridge use. Following removal, we found two partridge nests in 1982 and one pheasant nest in 1983. All three were successful. We believe the low average nesting density for 1982-1983 (2.7 acres per successful nest) was primarily a result of the location of the site on a hillside and the distance of one-quarter mile to other permanent cover. The pheasant population was generally lower than average during this time period which could have also reduced nesting density. Still, we would not lease this site again as nesting cover.

The second strip on the Harvey farm was a mixture of grass and alfalfa and was located adjacent to a north/south fence line. The terrain was hilly, typical of the Steptoe area. At the north end of the strip was a large grove of trees and shrubs. Most of the strip had a north facing aspect. Mr. Harvey sprayed for Canada thistle in early spring of 1982 which stunted the alfalfa and reduced ground cover. About 50 percent of the strip became dominated by perennial grasses; the remainder by alfalfa and annual forbs. It was in the grass dominated part that we found one successful pheasant nest in 1981 and two pheasant nests in 1983 (one successful, one not). Two nests were located on level areas and the other on a slight north-facing slope.

To increase the potential for nesting on a per acre basis for Mr. Harvey's second strip we recommend the following: Eliminate about one third of the length of the strip which lies on a steep north-facing slope. And, re-establish alfalfa where it was eliminated by spraying.

Table 7. Game bird nests found on dryland study sites, 1981.

Farmer	Species	No. Eggs Found	No. Eggs Hatched	Vegetation Composition	Width of Strip in Feet	Distance From Edge in Feet	Estimate Distance to Water in Feet
Culbertson Strip 1	Pheasant	11	0	Int. W-grass	40	9	1,400
Culbertson Strip 2	Pheasant	14	0	Int. W-grass	24	4	2,900
	Pheasant	Unk[a]	Unk[a]	Smooth Brome, Int. W-grass	33	16	2,000
	Pheasant	14	0	Int. W-grass	38	19	1,500
	Partridge	10	0	Int. W-grass	26	6	2,700
Hagedorn	Pheasant	17	17	Int. W-grass	27	9	800
Harvey Strip 1	Pheasant	10	0	Alfalfa	65	32	900
Morgan Strip 1	Pheasant	5	0	Prickly Lettuce	10	3	10,000
Murray Strip 1	Pheasant	7	3	Tumble Mustard	32	16	1,300

[a] Evidence indicated the nest was successful and all eggs hatched. We were unable to determine clutch size.

Table 8. Game bird nests found on dryland study sites, 1982.

Farmer	Species	No. Eggs Found	No. Eggs Hatched	Vegetation Composition	Width of Strip in Feet	Distance From Edge in Feet	Estimated Distance to Water in Feet
Harvey Strip 1	Partridge	9[a]	9[a]	Alfalfa	65	19	2,500
	Partridge	3[a]	3[a]	Alfalfa	65	4	2,800
Harvey Strip 2	Pheasant	10	9	Grass/Alfalfa	65	20	2,000
Koenig	Pheasant	11	11	Annual Forbs	200	10	400
Robison	Partridge	13	13	Alfalfa	51	14	70
	Pheasant	14	0	Alfalfa	48	22	70
	Pheasant	10	0	Alfalfa	30	12	60
	Pheasant	14	--[b]	Alfalfa	60	12	60
	Pheasant	5	0	Alfalfa	82	11	60
	Pheasant	17	0	Alfalfa	83	22	70
	Pheasant	9	0	Alfalfa	83	36	85
	Pheasant	10	8[a]	Alfalfa	88	20	70
	Pheasant	14	0	Alfalfa	95	11	60
	Pheasant	5	0	Alfalfa	98	19	70
	Pheasant	17	0	Alfalfa	92	39	90
	Pheasant	10	0	Alfalfa	79	17	70
	Pheasant	13[a]	9[a]	Alfalfa	102	37	100

[a] Estimated number of eggs.

[b] Nest not found during revisit.

Table 9. Game bird nests found on dryland study sites, 1983.

Farmer	Species	No.[a] Eggs Found	No.[a] Eggs Hatched	Vegetation Composition	Width of Strip in Feet	Distance From Edge in Feet	Estimated Distance to Water in Feet
Culbertson Strip 1	Pheasant	13	13	Int. W-grass	30	5	1,400
Harvey Strip 1	Pheasant	9	9	Alfalfa	65	24	800
Harvey Strip 2	Pheasant	7	0	Grass/Alfalfa	65	20	2,000
	Pheasant	12	12	Grass/Alfalfa	65	20	2,000

[a] Estimated number of eggs.

The strips on the Koenig and Robison farms were similar in that both were on level areas adjacent to trees, shrubs, and a nearby creek. As mentioned earlier, the alfalfa/grass seeding on the Koenig farm failed and the site became dominated by annual forbs, especially tumble mustard and prickly lettuce. Following the winter of 1981-82 the litter became matted, providing poor nesting cover. Still, in 1982 we found a successful pheasant nest.

We found 12 pheasant nests and one partridge nest on Mr. Robison's site in 1982. Six of the pheasant nests we located by flushing the hen. None of these nests were successful. Of the remaining six, two hatched, one could not be relocated, two were abandoned, and the hen was killed on the other, we believe by an avian predator. Of the unsuccessful nests, one appeared to have been destroyed by a large mammal. We believe most of the nests were abandoned and later destroyed by Columbian ground squirrels as described in Einarsen (1956). The partridge nest was found after it hatched.

Mr. Robison's strip was 4,850 feet long and varied in width from 30 to 120 feet. It was bordered on one side by wheat and on the other by permanent cover consisting of trees, shrubs, and grasses. We noted several phenomenon related to nest locations on this site. Eleven of the 12 pheasant nests were closer to the edge adjacent to permanent cover. The partridge nest was closer to the field edge. Seventy-five percent of the pheasant nests were found where the strip is over 80 feet wide (35 percent of the length). And, two nests were found within 50 feet of each other.

We cannot account for the low rate of nesting success on the site in 1982. Baxter and Wolfe (1977) believe nest searches do not significantly increase nest desertion. Perhaps the site reflected the generally lower than average nesting success in southeast Washington in 1982 (Pat Fowler, pers. comm.).

In 1983 we did not find any nests on the site; we believe for two reasons. First, the presence of so much litter from the previous growing season prevented us from intensively searching the understory. The nesting cover was much denser than in 1982. Also, we conducted nest searches later in 1983 than in 1982 to hopefully reduce nest abandonment. The peak of hatch was nearly three weeks earlier in 1983 than in the previous year (Pat Fowler, pers. comm.), so our nest searches took place after the majority of the nests had hatched. With no nesting hens to flush, our searches in the dense cover were particularly ineffective.

Mr. Robison's site was not financed by the study. However, we recommend that to enhance the site, it should be widened to where the entire strip is at least 70 feet wide. This recommendation is based on our nesting data and opinions developed from observations in the field.

We did not find any nests on sites on the Carter, Marler, Pettibone or Repp farms. Carter and Repp established alfalfa/grass cover on north-facing slopes. We found less evidence of pheasant use (feathers, droppings, dust bowls) on slopes than on level sites adjacent to shrubs and trees. Such sites may be worth leasing but must be considered on an individual basis with respect to area, cost per acre, slope and distance to permanent cover and water.

Mr. Marler's site, a 1.2 acre triangle of alfalfa and grass, is located between a gravelled county road and wheat fields with a nearby creek and woody cover. Our

speculation is that the small area and nearby traffic inhibited nesting. Even though the cover itself was of high quality, we do not recommend leasing the site again.

Mr. Pettibone's site, an alfalfa strip 8,500 feet by 30 feet, showed considerable pheasant use. Use was greatest where alfalfa was the most dense, that being a low lying area adjacent to shrub and forb cover. To enhance this site we should eliminate about three-quarters of the strip and widen the remaining section to 70 feet. Seventy feet would be two passes of the size grain drill normally used by most farmers.

Because of the variety in location and cover, only one dryland site produced a pheasant nesting density exceeding two nests per acre. However, we feel the study has shown that it is possible to establish dryland cover that will produce two successful pheasant nests per acre per year. Baxter and Wolfe (1973), Dahlgren (1964), and Troutman and Fredrickson (1968) all reported finding pheasant nesting densities exceeding two per acre.

Nest searches in high quality cover are difficult and not very accurate. Following mowing, nest searches are easy, considerably less time consuming, and far more accurate. We are certain far more nests would have been found had the hay been removed from each site.

Because of the abundance of cover on the sites we leased, we asked all dryland cooperators who had sites with alfalfa to remove the hay in 1982 and 1983 to permit a more accurate search. Only one site was mowed. The other sites were not mowed because of an abundance of hay resulting from the Federal Payment in Kind Program, lack of equipment and difficulty in getting to the site. In future agreements with dryland cooperators we should stipulate that hay be removed from the sites. This will also reduce the cost of the program and reduce competition from weeds. By October the alfalfa should be one to two feet high and will serve as hiding cover.

The two grass strips on the Culbertson farm were similar in width mostly 10 to 50 feet wide), vegetation composition, and adjacent farm land use. Strip number one was 1,500 feet long and drains onto a county road. Strip number two was 2,800 feet long and drained onto the Snake River breaks above Schultz Bar. All nests were found in high quality grass cover. Three of the six nests found over the three year period were located where there are noticeable wide spots in the strips.

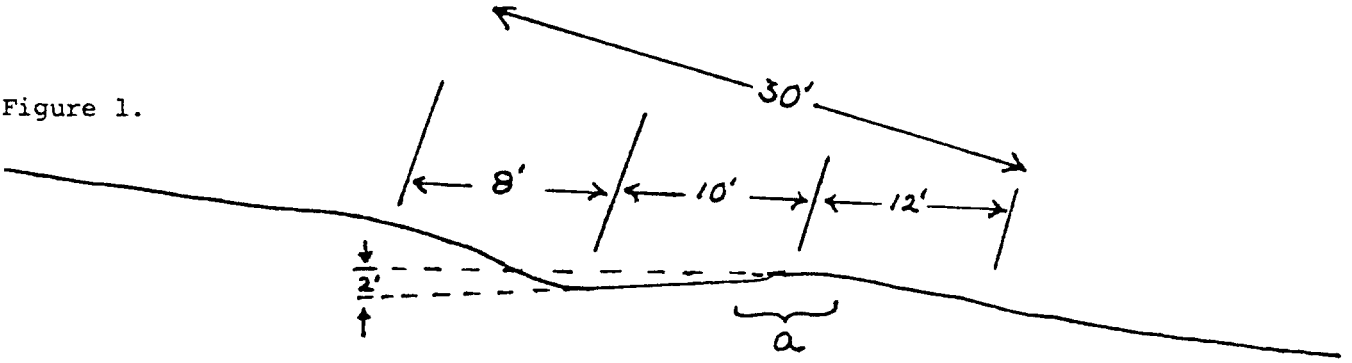
The grass strip on the Hagedorn farm was a 2,400 foot long fence row under a powerline. For all but 50 feet of its length the strip was less than six feet wide. Cover density was consistent the entire length of the strip. Yet the only nest found was located at the end where the strip was 27 feet wide and overlooked a county road 15 feet below.

During the three years of the study, we conducted nest searches on a total of 10.2 acres of grass strips on these two farms. We found three successful pheasant nests for a density of one nest per 3.4 acres.

Partridges would also be expected to utilize these areas as they exhibit a preference for nesting in permanent grass and forb cover (Glen Mendel, pers. comm.). We did find one partridge nest in the grass strips which was unsuccessful.

In 1981 we searched 4.6 acres of terraces and found two pheasant nests (one successful, one not). In addition we found a short-eared owl nest with seven eggs, all which hatched. Quality of cover at the time of the search was poor. We feel that an established stand of grass on these sites would significantly increase nesting success of upland birds. Figure 1 shows the portion of the terraces where all nests were found.

Figure 1.



[a] Zone on brim of terrace where three nests (two pheasant, one short-eared owl) were found.

Hammerstrom (1936) and Knott, et al. (1943) reported April clutch sizes to average 12.8 and 13 eggs respectively. Combined with a hatchability exceeding 90 percent (Hammerstrom, 1936; Nelson, 1950) we assume the average successful pheasant nest on our sites will hatch 12 chicks.

With an average of 50 percent mortality to the autumn (Baxter and Wolfe, 1973) and 50 percent cocks in each brood, we assume each successful pheasant nest will produce three cocks to the hunting season. An expected lease cost of $65 per acre for dryland sites seeded to alfalfa would result in a production cost of $10.83 per cock pheasant.

Irrigated

The design to test alfalfa as re-nesting cover is shown in Table 5. Four fields had two strips each, one within 50 feet of the edge, the other near the center.

We had not intended to test one width twice in the same field as with the 20 foot wide strips in 1981 and 1983. This occurred as a result of a misunderstanding with one of the cooperators.

Numbers and locations of nests are presented in Table 10. Only pheasant nests were found. The control strips were located 10 feet in toward the center of the field from the experimental strips and had the same dimensions.

Each strip was searched before being cut. Within two to five days following cutting, strips and controls were again searched. The third and final search to find nests which had been covered by windrows was conducted following removal of baled hay.

Table 10. Pheasant nests found in irrigated alfalfa strips left unmowed until the third cutting 1981, 1982 and 1983.

Strips		1981		1982		1983	
Width in Feet	Location	Total Nests	Successful Nests	Total Nests	Successful Nests	Total Nests	Successful Nests
10	Edge	1	1	0	0	0	0
	Center	1	0	0	0	1	0
20	Edge	1	1	3	2	0	0
	Center	1	1	4	3	2	1
30	Edge	0	0	2	2	2	2
	Center	0	0	6	5	4	3
40	Edge	2	2	3	2	2	2
	Center	2	2	2	2	Not Tested	

We found only two nests during the first search in 1981 and none in 1982 or 1983, an indication of how difficult it is to locate nests in dense alfalfa. During the second and third searches we found a total of eight nests in 1981, 20 nests in 1982 and eleven in 1983. Of the 39 nests, 31 were easily found and eight were difficult to find. During hay cutting, egg shells were scattered and nest bowls were altered making it difficult to determine the exact number of nests present. Where there was doubt as to the presence of a nest we did not include the data in Table 10.

An accurate count of the number of eggs which hatched in each nest in Table 10 could be made at only four nests. Eggshell and membrane fragments were too small and/or scattered at the other nests to determine the number of eggs present. An average of 8.0 chicks produced in each late nest (Baxter and Wolfe, 1973:28) was used for those nests.

In 1981 seven of eight nests hatched for a hatching success of 88 percent. In 1982 we found a hatching success of 80 percent (16 of 20) and in 1983 eight of eleven accounted for 73 percent hatching success. Of the seven unsuccessful nests, one was active and destroyed during alfalfa harvest, another may have been preyed upon (we found evidence of a dead hen), and the other five we assume were abandoned.

In 1981 three nests were found in control sites (two were successful). No nests were found in controls in 1982 or 1983.

To determine cost of producing a cock to the hunting season we applied the following constants. Each successful nest produces eight chicks. Of every eight chicks produced at least two will be cocks that will survive to the hunting season. The cost to lease irrigated alfalfa is approximately $175 an acre. Based on three years of nest data the approximate cost to bring a cock pheasant to the hunting season varies from $22.50 to $60 (Table 11).

Table 11. Estimated numbers of pheasant chicks hatched per strip, and estimated cost per cock surviving to the hunting season.

Strip Width in Feet	Strip Location	Cost Per Strip	1981 Chicks Hatched	1981 Surviving Cocks	1982 Chicks Hatched	1982 Surviving Cocks	1983 Chicks Hatched	1983 Surviving Cocks	$\bar{X}$ Cost Per Cock
10	Edge	$ 40	8	2	0	0	0	0	$60.00
	Center	40	0	0	0	0	0	0	----
20	Edge	80	8	2	16	4	0	0	40.00
	Center	80	8	2	24	6	8	2	24.00
30	Edge	120	0	0	16	4	16	4	45.00
	Center	120	0	0	40	10	24	6	22.50
40	Edge	160	16	4	16	4	16	4	40.00
	Center	160	16	4	16	4	Not Tested		40.00

Explanations are needed to clarify the data on mean costs per cock in Table 11. In the 10 foot wide strips we found two nests (both in 1981). We believe the successful nest hatched prior to mowing. Its location in the edge nesting strip was a coincidence. The other nest contained 19 eggs, all of which were laid between 18 June and 2 July. From this we concluded it was a dump nest.

In 1982 and 1983 we did not find any successful nests in the 10 foot wide strips. The fields in which these strips were located had produced successful nests in previous years. The cover and number of hens flushed during mowing were comparable both years.

Each year of the study the 20 foot wide strips produced zero to three successful nests. All pairs of strips were located in fields out of which an estimated 12 to 20 hens were flushed during mowing.

The number of successful nests in the 30 foot wide strips ranged from zero to five per strip. The field in which the 30 foot wide strips were located in 1981 was seeded the previous fall and may not have been attractive initially as nesting cover. Within one-half mile hens were flushed from two other alfalfa fields. We assumed these hens would establish nests in the strips left for that purpose. There was no other satisfactory nesting cover within at least a mile that we were aware of.

We believe there are several factors which account for the difference in nesting densities over the three years of the study (Table 12). Proximity to other permanent cover (shrubs, cattails, etc.), date of cutting (Table 13) and density of the alfalfa are probably the most significant. Farmers reported in 1981 that chicks were older than average during the first cutting of alfalfa and could more easily escape the swather. Still, the hatch was spread out over the spring and summer. We recorded a brood of pheasant chicks that hatched in the second week of August on the Bailie farm.

Table 12. Densities of successful pheasant nests (per acre) in irrigated alfalfa strips left unmowed until the third cutting, 1981-1982.

	Width of Strip (in Feet) and Location							
	10		20		30		40	
Year	Edge	Cent[a]	Edge	Cent	Edge	Cent	Edge	Cent
1981	4.3[b]	0.0	2.2	2.2	0.0	0.0	2.2	2.2
1982	0.0	0.0	4.4	6.5	2.9	7.3	2.2	2.2
1983	0.0	0.0	0.2	2.2	2.9	4.4	2.2	not tested
$\bar{X}$	1.4	0.0	2.2	3.6	1.9	3.9	2.2	2.2

[a] Center.

[b] Number of successful nests per acre.

Table 13. Comparison of dates for first cutting of irrigated alfalfa, 1981-1983.

	Date of First Cutting			Difference Between Years	
Farmer	1981	1982	1983	81-82	82-83
Bailie 1	17-20 June	28 May	2-6 June	21 days	6 days
Bailie 2	14-16 June	4 June	31 May	11 days	4 days
Harris	27 May	19-20 May	19 May	7 days	0 days
Lye/Brubaker[b]	---[a]	25 May	27 May	--	2 days
$\bar{X}$ Date	10 June	27 May	28 May	14 days	1 day

[a] Did not participate.

[b] Ownership transferred from Lye to Brubaker.

Only one out of the nine circle corners studied had sufficient cover for nesting. We searched the site between mid-June and August each year of the study and found evidence of pheasant use but no nests. In late August 1983 the site was cut and baled. A subsequent search of the site produced one successful nest for a density of one per 1.2 acres. We assumed that, had the site been cut and baled in previous years, we would have also found some nesting success.

If we can establish good quality cover on these sites in the future they should provide important nesting areas for pheasants.

Brood Counts

Brood counts were conducted during the performance of other fieldwork and are presented in Tables 14 through 17. The numbers in the tables represent birds flushed on the study sites only and do not reflect numbers of birds flushed in nearby cover.

On dryland sites we flushed pheasant broods prior to mid-June and after mid-August. Following hatching we believe hens lead their broods into pea and small grain fields. As harvest begins broods make use of the study sites for roosting and escape cover. We do not believe the study sites are important as brood cover between mid-June and mid-August.

We flushed only six broods from the irrigated strips, all in 1981. However, when the strips were mowed in late August or early September we noticed numerous roost piles from both adult and juvenile pheasants. This indicates the strips received heavy use as night roosting cover.

Table 14. Pheasant and partridge brood data collected on dryland study sites between 23 June and 17 September 1981.

Farmer	Species	Brood Size	Approximate Hatching Date	Hen Present	Number of Broodless Hens
Carter[a]	--	--	---	---	--
Culbertson[b]	Pheasant	2	26 May	yes	--
Hagedorn[b]	Partridge	11	26 May	yes	--
Harvey 1[c]	Partridge	5	Unknown	yes	--
Harvey 2[a]	--	--	---	---	--
Koenig[d]	Pheasant	4	30 July	yes	--
Morgan[d]	--	--	---	---	--
Murray[d]	--	--	---	---	--
Marler[a]	--	--	---	---	--
Pettibone[c]	--	--	---	---	--
Repp[a]	--	--	---	---	--
Robison[c]	Pheasant	5	1 July	yes	--

[a] Alfalfa/grass.

[b] Grass.

[c] Alfalfa.

[d] Annual forbs (tumble mustard, prickly lettuce).

Table 15. Pheasant and partridge brood data collected on dryland study sites 31 May to 1 September 1982.

Farmer	Species	Brood Size	Approximate Hatching Date	Hen Present	Number of Broodless Hens
Carter[a]	--	--	--	--	--
Culbertson[b]	Pheasant	3	12 June	yes	--
Hagedorn[b]		--	--	--	1 Partridge
Harvey 1[c]	--	--	--	--	--
Harvey 2[d]	--	--	--	--	--
Koenig[e]	Pheasant	4	26 June	yes	--
Morgan[f]	--	--	--	--	--
Murray[f]	--	--	--	--	--
Marler[d]	--	--	--	--	--
Pettibone[c]	Partridge	1	11 June	yes	--
Repp[d]	--	--	--	--	--
Robison[c]	Pheasant	5	22 May	yes	4 Pheasant
	Pheasant	2	26 June	no	
	Partridge	6	Unknown	yes	
	Partridge	1	17 July	yes	

[a] Grazed alfalfa/grass. [b] Grass, [c] Alfalfa. [d] Alfalfa/grass.

[e] Annual forbs (tumble mustard, prickly lettuce). [f] Terraces with no cover.

Table 16. Pheasant and partridge brood data collected on dryland study sites between 20 June and 13 September 1983.

Farmer	Species	Brood Size	Approximate Hatching Date	Hen Present	Number of Broodless Hens
Carter[a]	--	--	--	--	---
Culbertson[b]	--	--	--	--	---
Hagedorn[b]	--	--	--	--	---
Harvey 1[c]	--	--	--	--	---
Harvey 2[a]	Pheasant	1	19 July	yes	2
	Pheasant	1	14 August	yes	
Koenig[c]	Pheasant	3	29 July	yes	---
	Pheasant	5	8 July	yes	
	Pheasant	4	17 June	yes	
Morgan[d]	--	--	--	--	---
Murray[d]	--	--	--	--	---
Marler[a]	--	--	--	--	---
Pettibone[c]	Pheasant	8	21 June	yes	---
Repp[a]	--	--	--	--	---
Robison[c]	Pheasant	5	30 May	yes	---

[a] Alfalfa/grass. [c] Alfalfa.

[b] Grass. [d] Annual forbs.

Table 17. Pheasant brood data collected on irrigated study sites between 5 June and 13 September 1981.

Farmer	Species	Brood Size	Approximate Hatching Date	Hen Present	Number of Broodless Hens
Albin	--	--	--	--	2 Pheasant
Alford	--	--	--	--	--
Bailie	--	--	--	--	--
Bailie 1[a]	Pheasant	1	7 May	yes	--
Bailie 2[a]	Pheasant	8	19 July	yes	--
Bailie's Boys Ranch	--	--	--	--	--
Harris	Pheasant	4	19 June	yes	--
	Pheasant	3	6 July	no	--
Vogt	--	--	--	--	--
Winebarger	--	--	--	--	2 Pheasant
	Pheasant	1	5 May	no	--
	Pheasant	1	26 May	no	--

[a] Fields containing study sites are adjacent. Broods used both fields.

Pre-Season Flushing Counts

When flushing counts were conducted in 1981 and 1982 (Table 18) considerable cover existed adjacent to most of the study sites in the form of wheat stubble in dryland areas and unharvested crops in irrigated areas. In 1981 the greatest number of birds were flushed from the dryland study sites adjacent to trees and shrubs (Harvey 2, Koenig, Marler, Robison). The study site on the Pettibone farm (30 feet by 8,500 feet, consisting of alfalfa) was on the edge of a field adjacent to a variety of cover types including grass, forbs, shrubs, and trees. It was planted late in May 1981 and provided dense but short cover (less than 10 inches). In 1982 it was much denser and held the greatest concentration of game birds on any study site.

Where dryland cover was comparable between 1981 and 1982 there was a 65 percent reduction in the number of pheasants flushed in 1982. This compares with a 40 percent drop in the pheasant harvest from 1981 to 1982 in the five county area which comprises the southern part of Region One (Pat Fowler, pers. comm.).

Between mid-August and the general hunting season game and nongame birds began moving on to dryland sites. Numbers of nongame birds using these sites in 1982 were so high we decided to record the use. We counted 200 nongame birds on the study sites versus ten on controls.

On irrigated study sites, circle corners with the best cover (Vogt, Albin) were scattered with roost piles. The corners on Bailie's Boys Ranch had scattered cover which showed evidence of use by pheasants. Several of the circles had no cover and were not searched.

Counts on the Bailie, Harris, Lye and Winebarger farms were conducted in the fields where alfalfa strips had been located. Cover adjacent to these fields held most of the birds.

Compared to overall pheasant densities in Franklin County, our sites held few birds. We expect that birds hatched on our sites moved into corn, asparagus, cattails and other standing cover. This shows the importance of having a complex of different cover types for optimum production.

Table 18. Pre-hunting season flushing counts conducted on dryland and irrigated study sites between 2 September and 2 October 1981 and between 20 September and 8 October 1982.[a]

		1981		1982	
Farmer	Acreage	No. Birds[b] Flushed	Birds Per Acre	$\bar{X}$ No. Birds[b] Flushed	Birds Per Acre
Dryland					
Carter	2.5	--	--	--	--
Culbertson	3.2	--	--	2.7	0.8
Hagedorn	0.2	5[c]	25	--	--
Harvey 1	4.0	--	--	1	0.3
Harvey 2	5.0	44	8.8	5.7	1.1
Koenig	3.0	31[d]	10.3	5.3	1.9
Marler	1.2	7	5.8	--	--
Morgan	2.3	--	--	--	--
Murray	2.0	--	--	--	--
Pettibone	5.8	3	0.5	29.7	5.1
Repp	3.0	--	--	3.7	1.2
Robison	5.3	27[e]	9	12	2.3
Irrigated					
Albin	3.0	3	1	--	--
Alford	10.0	--	--	--	--
Bailie 1[f]	40.0	12	0.3	--	--
Bailie 2	40.0	11	0.3	--	--
Bailie's Boys Ranch	10.0	--	--	--	--
Lye[f]	20.0	[g]		--	--
Winebarger[f]	40.0	13	0.3	[g]	
Vogt	1.2	--	--	0.7	0.6

[a] One count was conducted in 1981, three in 1982.

[b] Pheasants unless otherwise noted.

[c] Partridges.

[d] Nine pheasants, 22 quail.

[e] Twenty-six pheasants, 1 quail.

[f] Field in which irrigated alfalfa strips were located.

[g] Did not participate.

Winter Flushing Counts

In 1982 counts were conducted in harsh, moderate, and mild winter weather. In 1983 all counts were conducted in moderate weather. In addition to our study sites, we received permission to search corn fields on two other areas: McNary National Wildlife Refuge (NWR) and Nedrow Farms, both in Walla Walla County. McNary NWR required sharecroppers to leave a percentage of corn standing for waterfowl feed. We conducted flushing counts in 20 acres of standing corn strips. Nedrow Farms grew 1,400 acres of corn in 1981. They were unable to harvest 40 acres of sweet corn which had lodged. We searched that as well as standing stubble and disced stubble. In 1983 we searched the same fields with exception of the 40 acres of standing sweet corn.

In 1982 the first round of winter flushing counts was conducted between 5 January and 14 January. There was snow on all of our study sites. Snow depth ranged from 4 inches in Walla Walla to 30 inches in the Pullman area. The second and third counts were conducted during more moderate weather (little or no snow and higher temperatures). In general, during severe weather game birds concentrated around trees and shrubs, which provided more protection than our cover strips. However, seed-eating nongame birds made extensive use of our cover strips by feeding on exposed seed heads available above the snow. In some areas our cover strips provided the only noticeable food source available to these birds. As winter moderated game bird use increased (dryland sites particularly) while nongame use declined.

For both 1982 and 1983 the greatest use of dryland study sites (Table 19) by game birds occurred on those sites adjacent to trees and shrubs (Koenig and Robison). Evidence of pheasants (flushed birds, droppings, etc.) was found on or near each of the dryland study sites.

All controls for dryland sites were located in the same field or in an adjacent field which was cultivated in a similar manner. Controls consisted of standing stubble, seeded grain, lentils, or disced sod. For comparison, we flushed a total of 340 game birds on study sites during 1982-83 winter flushing counts versus a total of 24 game birds on controls. Comparable totals for nongame birds were 301 on study sites versus 16 on controls.

We flushed what we considered to be very few game and nongame birds from standing corn and stubble. This may be a function of land use adjacent to the corn fields; where there is low pheasant production there will be few birds to overwinter.

Corn growers consider discing stubble to be a low priority activity. Many do not disc their fields until after severe winter weather, thereby reducing the need to insure a winter food supply for pheasants. We do not consider it practical to lease corn stubble as food or cover for pheasants.

For both dryland and irrigated sites in general (Tables 19 and 20), 1983 counts were considerably lower than 1982 counts. The most equitable comparisons deal with sites where habitat in 1983 closely resembled that in 1982. Five such dryland sites (Harvey 1 and 2, Koenig, Marler, and Robison) showed a decline of 45 percent for game birds and 83 percent for nongame birds in terms of birds flushed per acre.

Table 19. Comparison of winter flushing counts for game and nongame birds on dryland study sites, 1982 vs. 1983.

		Game Birds				Nongame Birds			
		1982		1983		1982		1983	
Farmer	Acreage	X No.[a] Flushed	Birds Per Acre	X No.[a] Flushed	Birds Per Acre	X No.[a] Flushed	Birds Per Acre	X No.[a] Flushed	Birds Per Acre
Carter	2.5	0	0	0	0	2	0.8	2	0.8
Culbertson	3.2	0	0	0	0	0	0	1.3	0.4
Hagedorn	0.2	0	0	0	0	0	0	0	0
Harvey 1	4.0	2.7	0.7	0	0	1.7	0.4	0	0
Harvey 2	5.0	0	0	3	0.6	37	9.3	0	0
Koenig	3.0	26	8.7	16.3	5.4	7	2.3	3.3	1.1
Marler	1.2	0	0	0	0	5.3	4.4	1.3	1.1
Morgan	2.3	0	0	0	0	0.7	0.3	4.3	1.9
Murray	2.0	0	0	0	0	2.1	1	0	0
Pettibone	5.8	0	0	0	0	2.3	0.4	2.7	0.5
Repp	3.0	0	0	3.0	1.0	1.0	0.3	0	0
Robison	5.3	40	13.3	22.3	4.2	11.0	2.1	5.3	1

[a] Based on an average of three counts.

Table 20. Comparison of winter flushing counts for game and nongame birds on irrigated study sites, 1982 vs. 1983.

Farmer Type of Cover	Game Birds				Nongame Birds			
	1982		1983		1982		1983	
	X No.[a] Flushed	Birds Per Acre	X No.[a] Flushed	Birds Per Acre	X No.[a] Flushed	Birds Per Acre	X No.[a] Flushed	Birds Per Acre
McNary Wildlife Refuge								
Unharvested Standing Corn	27	1.4	28	0.7	108	5.4	46	1.2
Unharvested Chopped Corn	1.5	0.08	18	0.5	18	1.8	1	0.03
Nedrow								
Unharvested Lodged Corn	1	0.01	--	--	5.7	0.2	--	--
Standing Corn Stubble	1.7	0.3	3	0.02	14	0.2	18.7	0.1
Disced Corn Stubble	1.7	0.2	0	0	24.7	0.3	4	0.05
Albin								
Circle Corner	0	0	0.7	0.2	1	1.0	0	0
Alford								
Circle Corners	0	0	0	0	0	0	0	0
Bailie's Boys Ranch								
Circle Corners	0	0	0	0	12.3	1.2	0	0
Vogt								
Circle Corner	0	0	0	0	9.7	8.1	0	0

[a] Based on an average of three counts.

Public Access and Hunting Success

Because of man power limitations we attempted to monitor public access and hunting success through the use of postcard questionnaires. In 1981 we provided the questionnaires to the cooperating farmers and asked them to distribute them when hunters asked permission to hunt. Only twelve questionnaires were returned to us. Part way through the season it became evident this method of data collection was not working.

When we contacted the farmers to find out why, they explained that many times when a hunter stopped to ask permission to hunt they were working in the field and did not have any questionnaires on their person. This resulted in either none or only a few being handed out by the farmers. Only one farmer, Martin Marler, handed out a significant number of cards, and this was partly because he had the postcards on his person the opening day of hunting season. As the hunting season progressed he too was handing out fewer cards.

Of the 12 questionnaires received, 11 were from parties who had hunted on the Marler farm. The other questionnaire had been signed by the hunter, not the farmer. Assuming the card without the farmer's name was not handed out by Mr. Marler and that Mr. Marler handed out all 40 postcards provided, we had a return of 28 percent. By comparison, an envelope at the same location, had a return rate of 45 percent (Baxter and Wolfe, 1973).

There was confusion for some hunters in interpreting the right column of the postcard---Previous Hunt on Land Not Enrolled in This Program (Appendix A). Four hunting parties left the column blank. In addition, two hunting parties were afield opening day so they could not provide data on a previous hunt. The data from these six postcards are presented in Table 21 and data from the other six postcards are presented in Table 22.

Table 21. Data from postcard questionnaires which did not include information from a previous hunt, 1981.

	Hunting Parties								Total
Number in Party	3[a]	1[a]	1[a]	1	2	1	4	3	16
Hours Hunted	2	3	5	2.5	3	2	6	1.5	--
Total Hours Hunted	6	3	5	2.5	6	2	24	4.5	53
Game Bagged									
Pheasant	4	-	1	3	3	-	5	2	18
Gray partridge (Hun)	-	-	-	-	-	-	2	-	2
California quail	-	-	-	-	3	-	-	8	11
Mallard	-	-	-	-	-	-	5	-	5
Teal species	-	-	-	-	-	-	2	-	2

[a] Data from three separate hunts were listed on one postcard. This postcard was signed by a hunter, not the farmer.

Table 22. Data from postcard questionnaires which included information from hunts on farms with a study site and previous hunts on lands not in the program, Game Farm Alternative Study, 1981.

	Hunting Parties												TOTAL	
	1		2		3		4		5		6			
	This Hunt	Prev. Hunt	This Hunt	Prev. Hunt	This Hunt	Prev. Hunt	This Hunt	Prev. Hunt	This Hunt	Prev. Hunt	This Hunt	Prev. Hunt	This Hunt	Prev. Hunt
Number in Party	2	6[a]	2	2	2	2	4	4	1	1	2	2	13	17
Hours Hunted	2.5	12[a]	2.5	3	3	2	1	-[b]	4.5	4	1	3	--	--
Total Hours Hunted	5	72[a]	5	6	6	4	4	-[b]	4.5	4	2	6	26.5	92+
Game Bagged Pheasant	1	--	4	1	2	1	1	3	1	3	-	-	9	8
Gray part. (Hun.)	-	--	-	-	-	-	-	1	2	-	-	-	2	1
Cal. quail	-	--	-	-	-	-	2	-	3	-	-	-	5	-
Chukar	-	--	-	-	-	-	-	-	-	3	-	-	-	3
G-w teal	-	--	-	-	-	-	-	-	-	-	1	-	1	-
Duck species	-	3[a]	-	-	-	-	-	-	-	-	-	-	-	3

[a] Includes data from two hunts.

[b] Information not on postcard.

Perhaps as important as the data on the postcards are the following comments of the hunters: "Good location, thanks." "Excellent hunt for opening weekend." "Mr. Marler is a very gracious and cooperative host." "We need more soil conservation; birds would be a neat by-product of soil conservation projects." "It is nice to find a spot like Mr. Marler's place that is open to hunting just by asking."

Because of the low number of postcards received we decided to randomly monitor the areas where the study sites are located. The following observations were made during the 1981 hunting season:

(1) Hunting By Permission Only signs were placed near buildings or where the farmer was concerned about hunters driving onto a field.

(2) Some farmers did not put up hunting signs. They assumed responsible hunters would ask permission, while others would hunt regardless.

(3) In general, cooperating farmers were not concerned with trespass on areas of the farm where they felt hunters could do little damage (i.e. fields away from buildings or livestock).

(4) Some hunters who received permission did not hunt where the study site was located. Frequently hunters entered an adjacent farmer's field if they spotted good cover and saw no signs to deter them.

(5) Some farmers would grant permission to a hunting party and not care if anyone in the party asked permission again for the remainder of the season.

In 1982 we tried to gather data by placing nine inch by 12 inch reader boards on each site. Each reader board was nailed to a post placed on the site and asked each party to take a questionnaire.

We placed 20 postcards on each reader board at the start of the general hunting season. By the end of the season we received only seven cards. The data from these cards are presented in Table 23.

Table 23. Data from postcard questionnaires, 1982.

	Hunting Parties							Total
Number in Party	2	1	2	2	2	3	2	12
Hours Hunted	1	2	4	3	7	4	1	22
Total Hours Hunted	2	2	8	6	14	12	2	46
Game Bagged								
Pheasant	-	2	1	4	4	7	-	18
Gray Partridge (Hun.)	-	-	-	-	3	-	-	3
Quail	-	-	-	-	-	-	-	-

Three of the questionnaires indicated previous hunts for a total of three hunters, five hours hunted, and four pheasants bagged.

All of the comments on the cards were favorable and reflected the opinions of hunters we spoke to. As in 1981 several hunters visited the sites more than once during the hunting season. Some who hunted the sites in 1981 were disappointed to flush fewer birds in 1982.

We were curious why hunters responded so poorly to the presence of the questionnaires. On opening day at two sites we observed hunters walk past the reader boards and not take cards. The best indication we could get from interviewing hunters was that the larger and more imposing the sign the more likely they would be to respond to it.

Spent shotgun shells on the study sites indicated that far more hunters used the sites than were indicated by numbers of hunters we observed or number of questionnaires returned. Hunting pressure was sporadic and most hunters felt the birds were wild and scattered. Response to the concept of the program was positive as exemplified by a hunter from Spokane who, in 1981, bagged three pheasants in six hunting trips to Bud Harvey's farm. He compared the area to a release site populated with wild birds. He and two other members of the hunting party felt if they flushed birds, regardless of whether or not one was bagged, the trip was worthwhile.

At the end of the hunting season we contacted each farmer and asked for estimates on the numbers of hunters and birds bagged on his farm (Table 24).

Table 24. A comparison of estimated numbers of hunters counted and numbers of pheasants bagged on farms participating in Game Farm Alternative Study, 1981 vs. 1982.

Type of Habitat / Farmer	Estimated Average No. of Hunters 1981 Weekend[a]	1981 Weekday[b]	1982 Weekend[a]	1982 Weekday[b]	Estimated No. of Pheasants Bagged[c] 1981	1982
Dryland						
Harvey	40-48	10-25	30-50	5-10	30+	25+
Koenig	8-10	15	20	10	25+	50+
Marler	20-30	15-25	40-50	25	50+	30-50
Pettibone	20	15-20	50	5	125-140[d]	50-100[d]
Repp	40-50	20	15	10-15	No Idea	10-20
Irrigated (Alfalfa Strips)						
Bailie[e]	20-30	25	25-40	15	290-500	300-400
Harris	10-40	25	30	5	30+	50+
Lye[f]	-	-	20	10	-	30+
Irrigated (Circle Corners)						
Albin[e]	20-35	15-40	25-30	30-40	No Idea	No Idea
Alford[e]	14-20	20-25	30-35	30	No Idea	No Idea
Boys Ranch[e]	10-40	10-30	30	30-40	30+	No Idea
Vogt	10-20	5-25	6-8	5-20	50-160	

[a] Average for each 48 hour period.

[b] Average for each 120 hour period.

[c] Number is for entire farm for entire season.

[d] Number includes partridges.

[e] Mr. Bailie is enrolled in Hunting By Written Permission program; Messers Albin, Alford, and the Boys Ranch are enrolled in Feel Free to Hunt program; all other farmers allow hunting by permission.

[f] Mr. Lye did not participate in 1981.

As a result of our program, we believe some farmers have been stimulated to become more aware of upland game. Consequently, 1982 estimates for pheasants bagged may more accurately reflect actual numbers than in 1981. We believe the pheasant harvest estimates are low. The most accurate estimates are probably those of Mr. Bailie. He is an avid pheasant hunter who makes an effort to find out how many birds are bagged on his farm.

For both 1981 and 1982 the estimated numbers of hunters more closely reflects the first weeks of the hunting season. Our spot checks on study sites in 1982 indicated less use during the latter part of the hunting season than shown in Table 24. These estimates indicate a considerable amount of hunting occurs on farms on which study sites are located.

When asked to compare 1981 to 1982, cooperators generally believed far fewer pheasants and partridges were available in 1982. They also felt hunting pressure was heavier at the start of the 1982 season but rapidly declined to below the 1981 average. They felt the study sites in particular received more hunting pressure in 1982.

Irrigators generally felt there were slightly more pheasants in 1982. They also thought hunting pressure was about the same for both years. They agreed that the low harvest could be due, in part, to the late harvest of corn. The standing corn provides excellent hiding cover and is closed to hunting until after harvest.

It is difficult to accurately monitor public access and hunter success on areas when manpower is limited. Our relatively cost-effective methods showed that the study sites are receiving a significant amount of use and are providing the public with additional opportunity to hunt. As the program continues and becomes more visible we can expect an increase in consumptive as well as non-consumptive use by the general public.

Farmer Acceptance Of The Program

Landowners were generally in favor of the work we conducted on their lands. It was evident that as habitat improved on their property and game bird numbers increased, they became more interested in preserving and enhancing the habitat.

We had no problems with landowners prohibiting public access and they seemed very tolerable of increased hunter use on their land.

We did incur some problems with landowners during the three years of the study. Weed control is often a necessary part of a farming operation but it can be, and was, a detriment to some of our habitat establishment efforts. Close monitoring and prudent use of herbicides should minimize future problems.

Trespass cattle, burning and driving on the study sites have been problems in the past but should be minimal with continued monitoring of the sites and education of the landowners.

We asked landowners to estimate the length of lease they would be willing to accept. Five dryland operators said indefinitely; one said five to eight years and the last one said three years. They all felt that the length would be determined by how the program would affect their operation.

Irrigators all said three years. Leaving strips of alfalfa was considered more of an aesthetic problem rather than an operational one.

Interim Compensation

Compensation is based on the number of pheasant equivalents produced on study sites less those produced on controls. Other compensation can include winter use by game and nongame birds in addition to use by deer and other mammals. All use not related to pheasant nesting was documented but was not assigned a dollar value.

Pheasant equivalents per successful nest are calculated differently for dryland and irrigated sites. We assumed each successful dryland nest produced three cocks to the hunting season and each nest on irrigated sites produced 2 cocks to the hunting season.

Dryland

For the 1982 and 1983 nesting seasons we found a total of four successful pheasant nests and two successful partridge nests on dryland sites enrolled in the study. Nests were difficult to locate in the standing alfalfa. By conducting subsequent nest searches on some of the sites after the alfalfa was cut and baled, we found that additional nesting had taken place. We had to estimate nesting density on dryland sites because the cover was not removed in all cases as it was on irrigated sites.

Some of the dryland sites obviously had higher quality nesting cover than others. This was determined by proximity to other wildlife needs such as water, food and hiding cover. Quality of nesting cover was also determined by its density.

We determined that nesting density on these quality sites would conservatively approach one nest per two acres. On poorer quality sites we estimated production to reach one nest per four acres. Again, this is a conservative estimate.

Twenty-two acres of dryland study sites were involved in the study and were searched to determine nesting success in 1982 and 1983. Out of 44 total acres, we considered 32 to be high quality cover and twelve to be of medium to poor quality.

Thirty-two acres at one nest per two acres equals 16 nests. Twelve acres at one nest per four acres equals three nests for a total of 19 successful nests produced on dryland sites. No nests were found on dryland controls.

19 pheasant nests x 12 chicks/nest (Knott, et al., 1943) = 228 chicks.
228 chicks x 50% mortality (Baxter and Wolfe, 1973) = 114 pheasants.
114 pheasants x 50% cocks = 57 cock pheasant equivalents.

Dryland compensation = 57 pheasant equivalents for 1982 and 1983.

Irrigated

For purposes of calculating production, we are assuming all successful pheasant nests on our irrigated study sites were a result of renesting and produced eight chicks per nest (Baxter and Wolfe, 1973). We also assume that successful pheasant nests on controls were early nests which hatched before first cutting and produced 12 chicks per nest.

A total of 18.4 acres of irrigated nesting cover were searched over the course of the

study. Only two nests were found prior to harvest. After the alfalfa was removed, during normal third cutting operations, an additional 33 successful nests were found for a total of 35. This again points out the difficulty and inaccuracy of nest searches in dense cover. Two nests were located on control sites.

Compensation is calculated as follows:

35 pheasant nests x 8 chicks/nest (Baxter and Wolfe) = 280 pheasant chicks
280 pheasant chicks x 50% mortality to hunting season = 140 pheasants
140 pheasants x 50% cocks = 70 pheasant cocks to hunting season.

2 pheasant nests on control sites = 6 pheasant cocks to hunting season.

Compensation = 70 cocks - 6 cocks = 64 cock pheasants

Total compensation (dryland and irrigated) = 57 + 64 = 121 cock pheasants.

Other Compensation

Winter and autumn use by both game and nongame birds and mammals indicated study sites were valuable for more than nesting. The cover had been removed from irrigated sites and had little to offer wildlife. As a result, the following information pertains mainly to the dryland sites unless noted.

Production of cock pheasants on the study sites (including irrigated) was only half of total pheasant production. There were also 121 hen pheasants produced. Hens that survive the winter become part of the broodstock pool for the following year, thereby increasing potential production.

During 1982 and 1983 winter counts we flushed an average of 26 (1.3 per acre) game birds on study sites versus four on controls. We also flushed an average of 33 (1.7 per acre) nongame birds on study sites compared to none on controls.

During 1981 and 1982 pre-hunting season counts we flushed an average of 65 (3.3 per acre) game birds versus none on controls. Numbers of nongame birds flushed during 1982 counts averaged 53 (2.7 per acre) versus three on controls.

Frequently while conducting fieldwork we noticed raptors hunting over experimental sites. Their flight paths followed the lay of the study sites. Species observed included sharp-shinned hawk, marsh hawk, red-tailed hawk, Swainson's hawk, American kestrel and short-eared owl.

We counted deer beds found on both experimental and control study sites during 1982 nest searches. We found 45 beds on experimental and none on control sites. During the course of the study we flushed or spotted a total of 15 white-tailed deer on experimental sites. It is our opinion that the deer were using the sites for both cover and food.

Benefits to Cost

Comparisons are based on production and stocking costs of game farm pheasants versus wild-reared pheasants from this study and on economic benefits of each to the State. Other wild-reared game (partridges and quail) are translated into pheasant equivalents.

Cost of Production

Game Farm Pheasants

Cost to buy and deliver a pheasant to the Snake River HMA headquarters = $6.50. An additional cost of $0.53 for delivery to release site = $7.03/released cock pheasant (1983 figures). We expect this cost to increase in the future due to inflation and other factors.

Wild-reared Pheasants

Costs per pheasant differ according to the type of habitat that is developed (Table 25). Several things are involved in determining average cost per pheasant. These include cost to lease sites, cost of goods and services such as seed, fence materials, shrubs, etc., as well as administrative and labor costs necessary to develop the habitat sites.

Table 25. Estimated Total Pheasant Production Costs According to Habitat Type.

	Type of Habitat				
	Dryland Nesting Cover	Fencing	Fence/ Shrubs	Grass Water-ways Terraces	Irrigated Nesting Cover
Development costs[a]	$11.27	$7.35	$8.41	$1.33	$21.88
Administrative costs[a]	7.25	6.60	6.60	3.38	11.31
Total cost/pheasant	$18.52	$13.95	$15.01	$4.71	$33.19

Hypothetical production rates from habitat development described in Table 25 would result in an overall average cost of $15.58 per pheasant equivalent.

[a] All costs are on a per pheasant equivalent basis.

Administrative time and labor vary with each type of habitat development. Factors involved include the actual development work, travel expense, maintenance, monitoring, and evaluation of production on each site. Farmers willing to establish dryland or irrigated nesting cover were more difficult to locate than farmers willing to permit fencing and shrub planting or grass establishment on terraces and along waterways. The higher costs partly reflect the increased effort necessary to locate farmers who are willing to develop dryland and irrigated nesting cover.

A break-down of all production costs is shown in Tables 26 and 27. These estimates are based on costs incurred during the three year study.

Costs per pheasant produced under this program are higher than the expected costs for each game farm pheasant. However, if some of the habitat development costs are amortized over several years the costs per pheasant are significantly lower. For example, a four strand barbed wire fence can be expected to last for 20 years with minor annual maintenance. Shrub and tree plantings can last even longer and will provide more cover with each year of growth. Certain varieties of dryland alfalfa are productive for 10 years or more.

Table 26. An example of Costs and Production from Hypothetical Habitat Development.

Type of Development Description	Cost per Acre	Cost Total	Pheasants Produced Per Acre	Pheasants Produced Total	Cost Per Pheasant
Dryland Nesting Cover					
500 Acres of Cropland	$65.00	$32,500.00	6	3,000	$10.83
Alfalfa Seed[a]	2.63	1,312.50			.44
					11.27
100 Acres of Grass	20.00	2,000.00	0.75	1,500[b]	1.33
Winter Cover					
Fencing (4mi. @ $3000/mi.) (8 sites @ 1.7 acres/site)	882.35	12,000.00	6	1,632[b]	7.35
Shrubs[c] (250 per acre @ $.50/shrub)	125.00	1,700.00			1.04
					8.41
Irrigated Alfalfa Strips					
60 Acres	175.00	10,500.00	8	480	21.88
Total Cost		$60,012.50			
Total Cock Pheasants to Hunting Season				6,612	

[a] Amortized over 10 years (expected productive life of alfalfa).

[b] Total production over 20 year period.

[c] Shrubs will be planted on fenced sites.

Table 27. Hypothetical Administrative Costs for Game Farm Alternative Program, (Based on production figures from Table 25).

Type of Overhead	Type of Habitat			
	Dryland	Fence/Shrub	Grass	Irrigated Nesting
Salaries/Benefits				
Per Bird	$ 6.13[a]	$ 6.12	$ 3.07	$ 9.20
Total	18,390.00[b]	9,988.00	4,605.00	4,416.00
Travel				
Per Bird	.78	.14	.16	1.85
Total	2,337.00	234.00	234.00	886.00
Subsistance				
Per Bird	.18	.30	.12	--
Total	540.00	490.00	180.00	--
Telephone/Supplies				
Per Bird	.16	.04	.04	.26
Total	480.00	60.00	55.00	125.00
Total Overhead				
Per Bird	7.25	6.60	3.38	11.31
Total	21,750.00	10,771.00	5,070.00	5,429.00
Grand Total	$43,020.00			

[a] Cost per bird calculated to nearest cent.

[b] Total cost calculated to nearest dollar.

Economic Benefits

Economic benefits are derived from Washington Department of Game studies and from Oliver (1977) for game farm pheasants and from Oliver (1979) for wild-reared game farm birds. Benefits are presented in Table 28.

Table 28. Comparison of economic benefits between game farm pheasants and wild-reared game birds, (Oliver 1979).

Species	Days to Harvest	X	Probability of Harvest	X	Dollars Spent Per Hunter Day	=	Economic Benefits
Game Farm Cock Pheasant	1.00	X	60%	X	$39.88	=	$23.93
Wild-reared Cock Pheasant	1.72	X	60% to 80%	X	39.88	=	$41.16 to $54.88
Partridge	1.27	X	11% to 30%	X	40.74	=	$ 5.69 to $15.52
Quail	0.79	X	17% to 30%	X	39.58	=	$ 5.32 to $ 9.39

The probabilities of harvest (Table 28) are based on populations ranging from moderately dense to dense. We anticipate population densities will increase as habitat is developed. Thus, economic benefits of wild-reared birds may more closely approach the higher figures in Table 28.

The relationship between days to harvest and probability of harvest does not seem equitable at first glance. However, survival of game farm birds, once released in the wild, is quite low. The birds are taken from an artificial environment and, without being acclimated to it, are released into a wild environment. Many lack the ability to find food for themselves and starve, or, they are taken by predators. On a large release site only 50 percent or less of the population may actually be available to harvest.

Wild pheasants are well adapted to living in the wild and have a strong survival instinct. They are less likely to be claimed by the elements and, therefore, are available to harvest for an extended period of time. If the hunting season stayed open longer or, if hunting pressure remained constant throughout the season, it is feasible that harvest could approach the 90th percentile.

CONCLUSIONS AND RECOMMENDATIONS

This study was originally set up to determine the feasibility of paying landowners to leave cover for upland game bird nesting. If found to be cost-effective, a program could be implemented to produce birds naturally in place of raising pheasants artificially for public hunting.

We planted and studied several types of cover under a variety of conditions. Study sites were located on dryland and irrigated ground. Cover types studied included alfalfa, grasses, and weed species in all combinations.

We established nesting cover in areas with water and permanent cover nearby. We found, as expected, that nesting densities were greatest on areas that provided these other factors in closest proximity.

We will achieve highest production of upland game in areas providing a complex of wildlife habitat needs (water, nesting and hiding cover). Food is normally not a problem with the wheat farming that takes place in the study area. Weed species growing on the habitat sites also provide a food source.

We recommend choosing sites that have one or more of the elements of ideal habitat present and developing the other components nearby. The results of the study provided us with the most cost-effective means to develop the various habitat elements and the amount of upland game production we can expect from them.

We recommend establishing habitat in the following ways:

1. Plant nesting cover composed of alfalfa and alfalfa/grass mixtures on dryland sites.
2. Fence creek bottoms and other non-cultivated areas to eliminate grazing and protect from future development.
3. Plant shrubs and trees in fenced off areas where ground moisture is present and natural re-vegetation from fencing is not likely.
4. Provide grass seed to farmers who will establish grass along waterways. Also work with farmers in an effort to convince them to develop a terracing program on their cropland. Provide grass seed to them to establish cover on these terraces.
5. In irrigated areas, lease strips of alfalfa to be left as nesting and re-nesting cover adjacent to permanent cover.
6. Establish cover on circle corners only under optimum conditions.

Dryland Nesting Cover

We recommend planting strips of alfalfa or an alfalfa/grass mixture in areas where nesting cover is limiting and where water and permanent cover currently exist. The species of alfalfa should be long-lived and adapted for non-irrigated environments. Ranger and Ladak are two such varieties. Strips should be located on bottom land or gentle, south-facing slopes. Exceptions should be made according to proximity to other cover and cost. Dimensions of the strips can be quite variable, ranging

from a minimum of 70 feet to over 100 feet wide and from several hundred feet to over 5,000 feet long. Plantings should be productive for a minimum of ten years.

We can logically expect production figures to reach six pheasants per acre on these sites at a cost of approximately $18.52 per bird (Table 25). Costs involved in production include annual lease of the site, seed (cost amortized over ten years) and administrative costs.

We recommend cutting and baling the alfalfa during normal third cutting operations. Profits to the farmer will reduce the overall cost per pheasant. Removing the alfalfa will also permit an occasional search of the sites to determine nesting use. Searches will determine if nesting use is significant enough to keep the sites enrolled in the program.

Sites should be seeded in early spring of a rate of 15 pounds of alfalfa or five pounds of alfalfa and ten pounds of grass per acre. All seed should be drilled rather than broadcasted.

Fencing

Many acres of prime upland habitat are lost each year due to herbicide use, burning and increased cultivation of land for higher production. It makes little sense to develop five acres of habitat in one area while five acres of habitat is lost in another.

We recommend fencing parcels of land that provide permanent cover such as shrubs and trees, grasses, cattails and/or tall forbs. Fencing will eliminate grazing and the tendency to develop into cropland. If the area has been grazed in the past, it should revegetate itself and increase the carrying capacity for upland game. We can expect to increase the population by six or more pheasant equivalents by improving one acre of this type of habitat.

Cost to lease such areas will be minimal but should be leased on at least a ten year basis to assure the cost-effectiveness of fencing. By amortizing the cost of the fence over twenty years (average life expectancy) we can produce pheasants for $13.95 each (Table 25). Cost per bird will decrease if we can tie our fence into existing fences. The initial investment is high but long range production costs will approach that of game farm birds.

Shrubs and Trees

In areas with sufficient ground moisture, planting shrubs and trees will increase cover and carrying capacity through the winter. These areas will also have to be fenced to protect the shrubs. If trees and shrubs are necessary to produce the six pheasants per acre achieved through fencing, the cost per bird will increase to approximately $15.01. This cost is also amortized over 20 years (Table 25).

We recommend planting the following shrubs which have been proven to be valuable to wildlife: blackthorn, Hanson's hedgerose, honeysuckle, lemonade sumac, Rocky Mountain

juniper, Russian olive and Siberian pea shrub. Environmental factors (precipitation, soil type, slope, resistance to grazing, etc.) will determine which species to plant where.

Waterways and Terraces

We found grass waterways produced a low rate of pheasant production but development costs were low and very little labor was involved. The landowners will be expected to plant the areas with seed supplied by us. We found production on such areas to be approximately .75 pheasants per acre at a cost of $4.71 each (Table 25). If these grass establishments are strategically located near other elements of habitat we can expect production to increase.

Our sample size for studying production on terraces was quite small. Although cover was relatively poor we still found some nesting taking place. We feel that establishing good quality cover on these terraces will result in increased production. We recommend working with farmers to show them how terraces are beneficial to their farming operations. Once installed, the farmer should seed them to grass to help prevent erosion and provide additional cover for upland game. Cost per bird should approximate that of waterways if the farmer provides the labor and we provide the seed.

As with other dryland plantings, all seed should be drilled rather than broadcasted for a well established stand of grass cover.

Irrigated Nesting Cover

This type of habitat development produced the greatest number of pheasant equivalents per acre but is also the most expensive.

We determined through the study that the optimum size of strip is 25 feet wide and from 1,000 to 1,400 feet long. Alfalfa should be left standing until the third cutting to serve as nesting and re-nesting cover as well as hiding cover for young chicks during alfalfa harvest.

Cost to lease irrigated alfalfa, based on lost profit for the landowner, was $175.00. This price will vary with the market but will serve as a base offering price to be adjusted annually. When materials, labor and administrative costs are considered, a production rate of eight pheasant equivalents per acre on these sites results in an average cost of $33.19 per bird (Table 25).

Due to the high cost of this type of cover, we recommend only developing it in areas severely lacking quality nesting cover and where irrigated alfalfa will complete a comprehensive complex of habitat necessary for optimum production.

The high cost of production in irrigated alfalfa is relative when considering the increased acres of land that can potentially be opened to public hunting because of this program.

Other aspects of using irrigated alfalfa for pheasant production were to raise the

swather mowbar during the first cutting of alfalfa to allow escapement of nesting hens. We do not recommend pursuing this further due to lack of support of this option from farmers. Delaying the first cutting of alfalfa received a similar response and should be eliminated as an option.

Circle Corners

We found it difficult to establish cover on corners of fields under center pivot irrigation. We believe this was due to a combination of low annual precipitation in the study area and sandy soils which did not hold moisture well.

The potential for cost-effective upland bird production on these sites can be great. Costs to establish habitat on these sites could approximate that of other dryland development. Because of the usual location of these sites (within close proximity of other irrigated crops) production could approach that of irrigated alfalfa.

To make this part of the program cost effective we recommend only developing sites that are either sub-irrigated or that consist of a soil type capable of holding moisture to the degree necessary for the establishment of dryland alfalfa. We also recommend an offering price of approximately ten dollars per acre to lease depending on the farmer's current use of the site.

Alfalfa should be seeded on these sites at a rate of 15 pounds per acre. Seed should be drilled, rather than broadcasted, in early spring.

Winter Wheat

We do not recommend leaving standing winter wheat as part of the program. We found that costs were high and production and use were low, eliminating this as a viable option.

Standing Corn and Stubble

We found the cost of leaving standing corn for pheasant production to be very expensive and do not recommend it in the future.

Farmers normally leave corn stubble until severe winter conditions have passed. It is unnecessary to lease these areas for winter pheasant use if they are normally providing for those needs.

Weed Control

We can expect an increase in noxious weeds on the sites that are developed. A weed control program will probably be necessary on some sites but we recommend it be kept to a minimum. Most weed control should be conducted by the farmer under our close direction.

EVALUATION OF PROGRAM

We recommend a monitoring and evaluation program be set up to assure the validity of the habitat development sites. Random sampling would show the degree of production on the sites and allow a determination to be made on whether sites are cost-effective. If a site is found to have low or no production, it could be dropped from the program and replaced somwhere else.

Habitat sites should be monitored to assure that cover is not being destroyed through mowing, spraying, grazing, etc.. The degree of maintenance necessary on fences and areas needing reseeding should also be monitored.

COST ESTIMATES FOR PHEASANT RELEASES AND HABITAT DEVELOPMENT

	FY 1984	FY 1985*
Pheasant Release Program		
3,420 Pheasants @ $6.50/pheasant	$22,230	$22,230*
Cost to Release @ $0.53/pheasant	1,813	1,813*
Total Cost $7.03/pheasant	24,043	24,043*
HABITAT PROGRAM		
Salaries and Wages		
Wildlife Biologist IV @ 10%	2,417	2,538*
Wildlife Biologist II @ 100%	21,886	22,980*
Clerk-Typist @ 5%	719	755*
Sub Total	25,022	26,273*
Employee Benefits (21%)	5,255	5,517*
Administrative Overhead (x 28.5%)	7,131	7,488*
Total Salaries, Benefits, and Overhead	37,408	39,278*
Travel and Subsistance		
Travel (1,500 mi/mo x 20.5¢)	3,690	3,690*
Meals and Overnight (5 days/mo x $20) (non-commercial lodging)	1,200	1,200*
Total Travel and Subsistance	4,890	4,890*

	FY 1984	FY 1985*
Goods and Services		
Telephone and Supplies ($60/mo)	720	720*
Total Salaries, Benefits, Overhead, Travel, and Subsistance	43,013	44,808*
HABITAT DEVELOPMENT		
Dryland Nesting Cover		
Leased Cropland		
(500 Acres @ $65/Acre)	32,500	
(650 Acres @ $65/Acre)		42,250*
Alfalfa Seed		
(15 lbs/Acre x 500 Acres x $1.75/lb)	13,125	
(15 lbs/Acre x 150 Acres x $1.75/lb)		5,250*
Sherman Big Blue Grass Seed		
1000 lbs @ $2.00/lb	2,000	2,000*
Total Development for Dryland Nesting Cover	47,625	49,500*
Winter Cover		
Fencing		
(4 mi. @ $3,000/mi.)	12,000	
(3 mi. @ $3,000/mi.)		9,000*
Shrubs		
(3,400 shrubs @ $0.50/shrub)	1,700	
(2,550 shrubs @ $0.50/shrub)		1,275*
Total Development for Winter Cover	13,700	10,275*
Irrigated Alfalfa Strips		
60 Acres @ $175/Acre	10,500	10,500*
Total Cost of Habitat Development	71,825	70,275*
GRAND TOTAL	$139,886	$139,206*

* Figures for fiscal year 1985 may be higher due to increment raises, inflation, etc.

SUMMARY

It was the intent of this study to determine if it is economically feasible to produce pheasants through habitat improvement as an alternative to raising 20,000 game farm pheasants per year to be released for public hunting.

Results from the study showed that, on a cost per bird basis, we can raise pheasants in an artificial environment cheaper than we can by developing habitat for natural production.

However, there are several side benefits to producing pheasants in a natural environment at a higher cost.

Wild-reared birds provide significantly higher economic benefits to the state of Washington than do game farm birds (Table 28).

Improved habitat is beneficial to game and nongame birds and mammals in general.

Although the study was geared toward production of cock pheasants, there were as many hen pheasants produced as were cocks. The hens that survive the winter become part of the breeding pool which will increase future production.

Use of the habitat by game and nongame animals provides an increase in recreation for consumptive and non-consumptive users.

The program requires that landowners open their land to public hunting. At a time when more and more private land is becoming unavailable for public hunting, study areas provide an increased opportunity for people to hunt. This program can result in several thousand acres being opened or remaining open for hunting.

The opportunity to hunt for and bag a wild bird provides a much greater aesthetic experience than does competing with other hunters in a confined area for game farm pheasants.

The Department of Game is interested in promoting a better hunting ethic by the public by relying on improved habitat management to increase pheasant populations naturally rather than releasing birds for the gun.

It is not feasible to think we can immediately produce 20,000 pheasants a year through habitat improvement. The money is not available to improve that much habitat. In future years, as more habitat is protected, developed or enhanced, we can expect to draw closer and even exceed that goal. We estimate that first year production from a proposed management plan will be approximately 6612 pheasants at an average cost of $15.58 each.

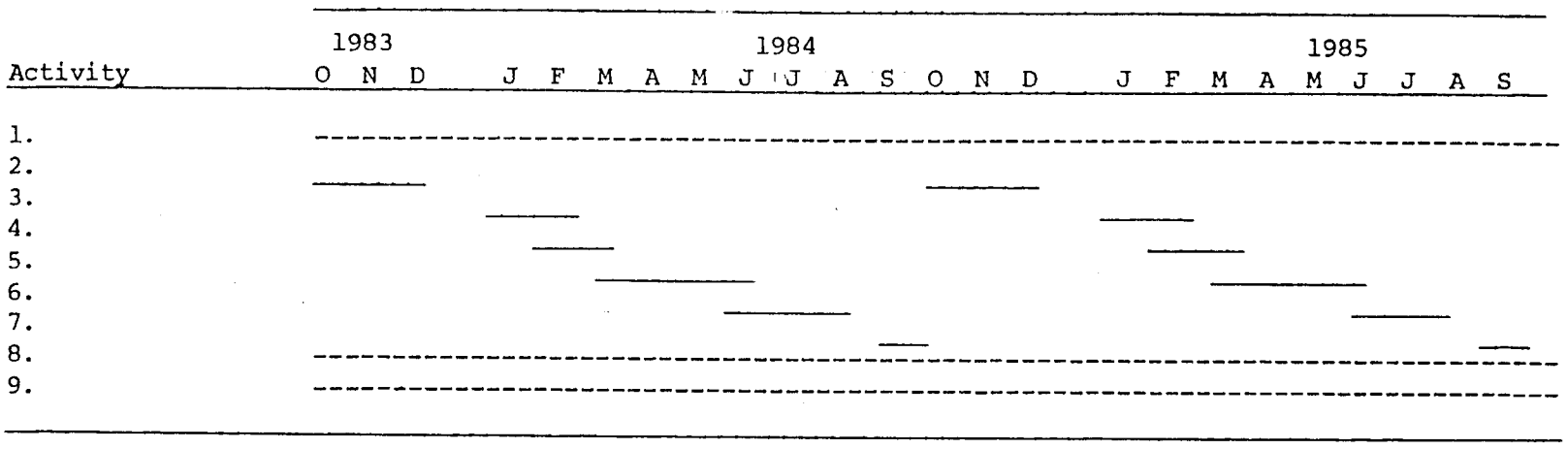
Considering the positive aspects of this program, we recommend entering into it on a full scale basis annually funded at a rate equal to the cost of releasing 20,000 game farm pheasants, minus the annual cost for the number of pheasants actually released.

We recommend the continued release of 2,000 to 5,000 game farm pheasants annually through 2002 to provide partial interim compensation until habitat developments on the Snake River can produce pheasants at pre-project levels. Cost of the game farm pheasants plus annual alternative habitat development would not exceed the cost of

20,000 released pheasants for each year of the program. Total funds available will vary annually as the cost for game farm birds and cost to release them changes.

The Washington Department of Game agrees that the program, set up in this manner, will fulfill compensation obligations assigned to the Corps of Engineers under the Lower Snake River Fish and Wildlife Compensation Plan. Those obligations were to plant 20,000 game farm pheasants a year until the year 2002. The Department prefers to initiate a program that will produce upland game naturally through habitat manipulation in lieu of planting the full 20,000 game farm pheasants each year.

PERSONNEL TIME SCHEDULE
GAME FARM ALTERNATIVE HABITAT PROGRAM



----- Irregular activity period
——— Regular activity period

ACTIVITY	PERSONNEL	SCHEDULE
1. Contact farmers, finalize details of agreements, obtain lease.	1 Biologist	1 October 1983 to 30 September 1985
2. Monitor public usage.	1 Biologist	1 October to 31 December
3. Winter flushing counts	2 Biologists	1 January to 28 February
4. Planting shrubs	2 Biologists	1 February to 31 March
5. Plant dryland nesting habitat	1 Biologist	1 March to 15 June
6. Nest searches	1 Biologist	15 June to 1 September
7. Prehunting season flushing counts	2 Biologists	1 September to 1 October
8. Erect fencing	2 Biologists	1 October 1983 to 30 September 1985
9. Administration	2 Biologists	1 October 1983 to 30 September 1985

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APPENDIX A

I _____ am participating in a habitat enhancement program designed to increase production of wild upland game birds. Please answer the following questions and mail this card.

	THIS HUNT	Previous Hunt on Land not Enrolled in this Program
Number in hunting party	_____	_____
Date hunted	_____	_____
Hours hunted	_____	_____
Game bagged		
Ring-necked pheasant	_____	_____
Hungarian partridge	_____	_____
California quail	_____	_____
Other_____	_____	_____

Comments_____

_____

Figure 1. Sample of hunter-use postcard questionnaire, Game Farm Alternative Study, 1981-1982.

APPENDIX B

WASHINGTON STATE DEPARTMENT OF GAME
GAME FARM ALTERNATIVE HABITAT AGREEMENT

On behalf of the people of the state of Washington, the following agreement is hereby enacted to benefit wildlife administered by the Department of Game.

To benefit wildlife and in recognition that 80% of our nation's lands are privately owned and produce most of our wildlife, let it be known that: The Washington State Department of Game and Floyd Harvey mutually agree upon this cooperative program.

Landowner/Lessee agrees to cooperate with the Department of Game in establishment and/or management of wildlife habitat, the intended purpose being to produce both game and nongame species of wildlife. Landowner/Lessee will be provided a monetary incentive for allocating farmland to be managed as wildlife habitat. The monetary incentive will be based on profit foregone and cost of establishing habitat on said farmland.

LEGAL DESCRIPTION: (See attached farm map)

Methods: Landowner/Lessee will establish and/or manage habitat as per the following description: In the spring of 1981 a mixture of alfalfa and intermediate wheat grass will be planted in a strip 3,135 feet by 70 feet (area = 5.0 acres) as shown on the attached map. Cost of seed (approximately $200.00) will be included in the 1981 payment. There will be no restrictions on spraying for weeds.
on sections:

Section 10; R43E, T17N, Whitman County, Washington

Program of Access: Mutual cooperation between landowner, Department of Game, and hunter is needed to insure that programs involving wildlife recreation on private lands remain in force. In coordination with RCW sections 4.24.200 and 4.24.210: "to encourage owners of land to make available land and water areas to the public for recreational purposes by limiting their liability toward persons entering thereon and toward persons who may be injured or otherwise damaged by acts or omissions of persons entering therein," Landowner/Lessee agrees to allow public access for both consumptive and non-consumptive wildlife recreation through the farmer/sportsman program Hunting by permission.

APPENDIX C

SPECIES AND NUMBERS OF UPLAND GAME COUNTED DURING WINTER FLUSHING COUNTS ON DRYLAND STUDY SITES, 5 JANUARY TO 23 FEBRUARY 1982.

Farmer	Count No. 1 5 - 12 Jan		Count No. 2 28 - 29 Jan		Count No. 3 16 - 23 Feb		$\bar{X}$ No. of Game Birds	
	Exp[a]	Cont[b]	Exp	Cont	Exp	Cont	Exp	Cont
Carter	0	0	0	0	0	8 Pheas	0	2.7
Culbertson	0	0	0	0	0	0	0	0
Hagedorn	0	0	0	0	0	0	0	0
Harvey 1	0	0	8 Part	0	0	0	2.7	0
Harvey 2	0	0	0	0	0	0	0	0
Koenig	3 Pheas	0	13 Quail	0	50 Pheas[c]	0	26.0	0
			10 Pheas	0	2 Part	0		
Marler	0	0	0	0	0	0	0	0
Morgan	0	0	0	0	0	3 Part	0	1.0
Murray	0	0	0	0	0	0	0	0
Pettibone	0	0	0	0	0	0	0	0
Repp	0	0	0	0	0	0	0	0
Robison	53 Pheas[d]	0	13 Pheas	0	48 Pheas	0	40.0	0
	6 Part[d]							
$\bar{X}$ No. of Game Birds	5.2	0	3.7	0	8.3	0.9	5.7	0.3

[a] Experiment.

[b] Control.

[c] Estimate.

[d] Some may have flushed from adjacent shrubs and trees.

APPENDIX D

SPECIES AND NUMBERS OF NONGAME BIRDS AND MAMMALS COUNTED DURING WINTER FLUSHING COUNTS ON DRYLAND STUDY SITES, 5 JANUARY TO 23 FEBRUARY 1982.

Farmer	Count No. 1 5 - 12 Jan		Count No. 2 28 - 29 Jan		Count No. 3 16 - 23 Feb		$\bar{X}$ No. of Animals	
	Exp[a]	Cont[b]	Exp	Cont	Exp	Cont	Exp	Cont
Carter	5 Song sparrow	0	1 Song sparrow	0	0	1 H lark	2.0	0.3
Culbertson	0	0	0	0	0	0	0	0
Hagedorn	0	0	0	0	0	0	0	0
Harvey 1	0	0	5 H lark	0	0	0	1.7	0
Harvey 2	5 Junco 1 Song sparrow 1 Weasel	1 Junco	0	0	100 Redpoll[c,d] 4 Junco	0	37.0	0.3
Koenig	1 M hawk 19 Goldfinch	0	0	0	1 Sparrow[e]	0	7.0	0
Marler	1 M hawk 2 Junco 10 Song sparrow 2 Passerine	0	0	0	1 Sparrow[e]	0	5.3	0
Morgan	0	0	1 H lark	1 H. lark	1 M-lark	0	0.7	0.3
Murray	5 H lark	1 H lark	0	0	1 H. lark	10 H lark	2.0	3.7
Pettibone	0	0	0	0	3 Redpoll[c] 4 Junco	0 0	2.3	0
Repp	3 H lark	0	0	0	0	0	1.0	0
Robison	5 Junco 15 Song sparrow 2 Passerine	0	2 Junco 1 Sparrow 4 Passerine	0	3 Song sparrow 1 Sparrow[e]	0	11.0	0
$\bar{X}$ No. of Animals	6.4	0.2	1.2	0.1	9.9	0.9	5.8	0.4

[a] Experiment.

[b] Control.

[c] Redpoll species.

[d] Estimate.

[e] Sparrow species.

APPENDIX E

SPECIES AND NUMBERS OF UPLAND GAME BIRDS COUNTED DURING WINTER FLUSHING COUNTS ON IRRIGATED STUDY SITES, 7 JANUARY TO 18 FEBRUARY 1982.

Farm Type of Cover	No. of Acres	Count No.1 7-14 Jan	Count No.2 2-3 Feb	Count No.3 17-18 Feb	X No. of Birds/Acre
McNary Wildlife Refuge					
Unharvested Standing Corn	20.0[a]	26 Pheas 1 M dove	--	--	1.4
Unharvested Chopped Corn	20.0[a]	--	1 M dove	2 Pheas	0.2
Nedrow					
Unharvested Lodged Corn	27.2	1 Pheas	0	0	0.01
Standing Corn Stubble	65.4	1 Pheas	2 Pheas 2 Part	0	0.03
Disced Corn Stubble	72.7	5 Part	0	0	0.02
Albin					
Circle Corner	0	0	0	0	0
Alford					
Circle Corners	0	0	0	0	0
Bailie's Boys Ranch					
Circle Corners	0	0	0	0	0
Vogt					
Circle Corner	0	0	0	0	0

[a] Standing corn was chopped following the first count and disced following the second count.

APPENDIX F

SPECIES AND NUMBERS OF NONGAME BIRDS COUNTED DURING WINTER FLUSHING COUNTS ON IRRIGATED STUDY SITES, 7 JANUARY TO 18 FEBRUARY 1982.

Farm Type of Cover	No. of Acres	Count No.1 7-14 Jan	Count No.2 2-3 Feb	Count No.3 17-18 Feb	X No. of Birds/Acre
McNary Wildlife Refuge					
Unharvested Standing Corn	20.0[a]	1 M hawk 1 S-e owl 14 W m-lark 2 B b-bird 1 R-w b-bird 14 A goldfinch 9 H sparrow 44 Junco 9 W-c sparrow 13 Passerine	--	--	5.4
Unharvested Chopped Corn	20.0[a]	--	19 W m-lark 1 B b-bird 1 R-w B-bird	12 W m-lark 1 B b-bird 1 R-w b-bird	1.8
Nedrow					
Unharvested Lodged Corn	27.2	15 W m-lark	0	1 H lark 1 W m-lark	0.2
Standing Corn Stubble	65.4	1 W m-lark 9 S sparrow 1 Passerine	2 W m-lark 6 S sparrow	15 H lark 6 W m-lark 2 Sparrow sp.	
Disced Corn Stubble	72.7	1 Sparrow	72 H lark 1 W m-lark	0	0.3
Albin					
Circle Corner	3	0	3 H lark	0	0.3
Alford					
Circle Corners	10	0	0	0	0
Bailie's Boys Ranch					
Circle Corners	10	35 H lark	0	0	1.2
Vogt					
Circle Corner	1.2	29 H lark	0	0	8.1

[a] Standing corn was chopped following the first count and disced following the second count.

APPENDIX G

SPECIES AND NUMBERS OF UPLAND GAME BIRDS COUNTED ON DRYLAND STUDY SITES DURING WINTER FLUSHING COUNTS, 11 JANUARY TO 24 FEBRUARY 1983.

	Count No.1 11-13 Jan		Count No.2 27-28 Jan		Count No.3 10-15 Feb		X No. of Birds	
Farmer	Exp	Cont	Exp	Cont	Exp	Cont	Exp	Cont
Carter	0	0	0	0	0	0	0	0
Culbertson	0	0	0	0	0	0	0	0
Hagedorn	0	0	0	0	0	0	0	0
Harvey 1	0	0	0	8 Part	0	0	0	2.7
Harvey 2	0	0	3 Pheas	0	0	0	1.0	0
Koenig	18 Pheas	0	23 Pheas	0	8 Pheas	0	16.3	0
Marler	0	0	0	0	0	0	0	0
Morgan	0	0	0	0	0	0	0	0
Murray	0	0	0	2 Part	0	0	0	0.7
Pettibone	0	6 Pheas	0	1 Pheas	0	0	0	2.3
Repp	5 Pheas	1 Pheas	2 Pheas	0	1 Pheas	0	2.7	0.3
Robison	35 Pheas	0	14 Pheas	0	18 Pheas	1 Pheas	22.3	0.3
X No. of Game Birds	4.8	0.6	3.5	0.9	2.3	0.1	3.5	0.5

a

APPENDIX H

SPECIES AND NUMBERS OF NONGAME BIRDS COUNTED ON DRYLAND STUDY SITES DURING WINTER FLUSHING COUNTS, 11 JANUARY TO 24 FEBRUARY 1983.

	Count No.1 11-13 Jan		Count No.2 27-28 Jan		Count No.3 10-15 Feb		X̄ No. of Birds	
Farmer	Exp[a]	Cont[b]	Exp	Cont	Exp	Cont	Exp	Cont
Carter	1 H lark	0	3 H lark	0	2 H lark	0	2.0	0
Culbertson	0	0	2 H lark	0	2 H lark	0	1.3	0
Hagedorn	0	0	0	0	0	0	0	0
Harvey 1	0	0	0	0	0	0	0	0
Harvey 2	0	0	0	0	0	0	0	0
Koenig	0	0	2 Junco 5 Sparrow sp.	0 0	3 W-c sparrow	0	3.3	0
Marler	2 Sparrow sp	0	2 W-c sparrow	0	0	0	1.3	0
Morgan	7 H lark	1 H lark	2 H lark	0	4 H lark	0	4.3	0.3
Murray	0	0	0	1 H lark	0	0	0	0.3
Pettibone	5 Sparrow sp	0	0	0	3 W-c sparrow	0	2.7	0
Repp	0	0	0	0	0	0	0	0
Robison	2 S Sparrow 1 Sparrow sp	0	2 S Sparrow 1 Sparrow sp	0 0	9 Junco 1 S sparrow	0	5.3	0
X̄ No. of Birds	1.5	0.1	1.6	0.1	1.3	0	1.5	0.1

[a] Experiment.

[b] Control.

APPENDIX I

SPECIES AND NUMBERS OF GAME BIRDS COUNTED DURING WINTER FLUSHING COUNTS ON IRRIGATED STUDY SITES, 13 JANUARY TO 24 FEBRUARY 1983.

Farm Type of Cover	No. of Acres	Count No.1 13-18 Jan	Count No.2 30-31 Jan	Count No.3 18-24 Feb	$\bar{X}$ No. of Birds/Acre
McNary Wildlife Refuge					
Unharvested,[a] Standing Corn	40	28 Pheas	--	--	0.7
Unharvested,[a] Chopped Corn	40	--	1 Pheas 17 Dove	--	0.5
Nedrow					
Standing Corn Stubble	130	5 Pheas	2 Pheas	2 Part	0.02
Disced Corn Stubble	73	0	0	0	0
Albin					
Circle Corner	3	0	2 Pheas	0	0.2
Alford					
Circle Corners	10	0	0	0	0
Bailie's Boys Ranch					
Circle Corners	10	0	0	0	0
Vogt					
Circle Corner	1.2	0	0	0	0

[a] Standing corn was chopped following the first count and disced following the second count.

APPENDIX J

SPECIES AND NUMBERS OF NONGAME BIRDS AND MAMMALS COUNTED DURING WINTER FLUSHING COUNTS ON IRRIGATED STUDY SITES, 13 JANUARY TO 24 FEBRUARY 1983.

Farm Type of Cover	No. of Acres	Count No.1 13-18 Jan	Count No.2 30-31 Jan	Count No.3 18-24 Feb	X No. of Birds/Acre
McNary Wildlife Refuge					
Unharvested,[a] Standing Corn	40	4 R-w blackbird 15 Junco 8 W-c sparrow 15 S sparrow 4 Sparrow sp.	--	---	1.2
Unharvested,[a] Chopped Corn	40	--	1 M hawk	---	0.03
Nedrow					
Standing Corn Stubble	130	2 W m-lark 1 B-t j-rabbit	1 S-s hawk 1 W m-lark 1 Junco 1 S sparrow 1 B-t j-rabbit	1 W m-lark 1 Junco	0.1
Disced Corn Stubble	73	1 H lark 8 W-c sparrow	0	3 H lark	0.05
Albin					
Circle Corner	3	0	0	0	0
Alford					
Circle Corners	10	0	0	0	0
Bailie's Boys Ranch					
Circle Corners	10	0	0	0	0
Vogt					
Circle Corner	1.2	0	0	0	0

[a] Standing corn was chopped following the first count and disced following the second count.

APPENDIX K

COMMON AND SCIENTIFIC NAMES OF PLANTS AND ANIMALS MENTIONED IN THE TEXT, TABLES AND OTHER APPENDICES.

Common Name	Scientific Name
Trees and Shrubs	
Blackthorn	Prunus spinosa
Hanson's hedgerose	Rosa hansoni
Honeysuckle	Lonicera tartarica
Lemonade sumac	Rhus trilobata
Rocky Mountain juniper	Juniperus scopulorum
Russian olive	Elaeagnus angustifolia
Siberian pea shrub	Caragana arborescens
Forbs	
Alfalfa	Medicago sativa
Asparagus	Asparagus officinalis
Canada thistle	Cirsium arvence
Cattail	Typha sp.
Russian thistle	Salsola kali
Prickly lettuce	Lactuca serriola
Sorghum	Holcus (Sorghum) sp.
Yellow sweetclover	Melilotus officinalis
Tumble mustard	Sisymbrium altissimum
Grasses	
Barley	Hordeum sativum
Cheatgrass	Bromus tectorum
Corn	Zea mays
Intermediate wheatgrass	Agropyron intermedium
Sherman big bluegrass	Poa ampla
Siberian wheatgrass	Agropyron sibiricum
Smooth brome	Bromus inermis
Wheat	Triticum--Triticale sp.
Birds	
Mallard	Anas platyrhynchos
American Green-winged teal	Anas crecca
Sharp-shinned hawk	Accipiter striatus
Swainson's hawk	Buteo swainsoni
Red-tailed hawk	Buteo jamaicensis
Northern Harrier	Circus cyaneus
American Kestrel	Falco sparverius
California quail	Lophortyx californicus

APPENDIX K (cont.)

Ring-necked pheasant	Phasianus colchicus
Chukar	Alectoris chukar
Gray or Hungarian partridge	Perdix perdix
Mourning dove	Zenaida macroura
Short-eared owl	Asio flammeus
Horned lark	Eremophila alpestris
House sparrow	Passer domesticus
Western meadowlark	Sturnella neglecta
Brewer's blackbird	Euphagus cyanocephalus
Red-winged blackbird	Agelaius phoeniceus
Redpoll sp.	Acanthis sp.
American goldfinch	Carduelis tristis
Dark-eyed junco	Junco hyemalis
White-crowned sparrow	Zonotrichia leucophrys
Song sparrow	Melospiza melodia

Mammals

White-tailed deer	Odocoileus virginianus
Weasel	Mustela sp.
Black-tailed jackrabbit	Lepus californicus
Columbian ground squirrel	Citellus columbianus

ATTACHMENT B

COOPERATIVE AGREEMENT

Contract No. DACW68-86-H-0010

COOPERATIVE AGREEMENT

GAME BIRD HABITAT PROGRAM FOR LOWER SNAKE RIVER FISH & WILDLIFE COMPENSATION PLAN

BETWEEN THE

U.S. ARMY CORPS AND ENGINEERS

AND

STATE OF WASHINGTON, DEPARTMENT OF GAME

1. PARTIES

The parties to this cooperative agreement are the U.S. Army Corps of Engineers, represented by the District Engineer, Walla Walla District (hereinafter referred to as the CORPS), and the State of Washington Department of Game, represented by its Director (hereinafter referred to as the STATE).

2. PURPOSE

a. The principal purpose of the relationship between CORPS AND STATE is the transfer of money by advance funding in order to accomplish the public purpose of mitigation by support or stimulation authorized by Congress. CORPS involvement in the contemplated activities will include developing the scope of work, monitoring of STATE performance to achieve the desired ends, and fiscal controls for protection of Government interest.

b. The purpose of this Cooperative Agreement is to set out the arrangements under which the CORPS and the STATE will carry out the Game Bird Habitat Program as an alternative to the bird stocking methods as more particularly discussed and approved in DM 20 of the Lower Snake River Fish and Wildlife Compensation Plan (LSRFWCP).

c. The STATE will implement, perform and administer the Game Bird Habitat Program to meet and satisfy all project objectives established by the LSRFWCP and DM 20.

3. AUTHORITY

a. Water Resources Development Act of 1976, PL 85-624, enacted October 22, 1976; LSRFWCP; and DM 20.

b. Section 6, Federal Grant and Cooperative Agreement Act of 1977 as amended by PL 97-258, 31 USC 6305 et seq.

4. DURATION OF AGREEMENT

This Cooperative Agreement shall become effective upon execution of this agreement by the District Engineer, Walla Walla District Corps of Engineers and shall continue in effect until terminated as provided for herein.

5. SCOPE OF WORK

a. The CORPS, in cooperation with the STATE, has identified and developed a scope of work to be accomplished by the STATE to fully satisfy the intents and purposes of the LSRFWCP and this cooperative agreement and is contained in DM 20. DM 20 shall become a part of this cooperative agreement as though fully set forth herein.

b. The STATE shall submit within 30 days from the effective date of this agreement a plan covering the details of performance of the Game Bird Habitat Program to the District Engineer's Representative for approval. The Plan may be altered or amended by mutal agreement of the parties and as the need arises to the end that both parties are fully aware of all work currently planned or in progress, or changed as required to meet program goals.

6. ADVANCE FUNDING AND DEFAULT

a. Payment to STATE in the amount of $2,125,000.00 for performance of this agreement will be made by the CORPS as soon as practicable following execution of the agreement by the District Engineer.

b. The STATE shall establish and maintain a separate account for deposit of said funds in a Federally insured account, hereinafter referred to as advance funds account, in order to pay and fund all STATE costs incurred in connection with the agreement and the Game Bird Habitat Program set out in DM 20 of the LSRFWCP. Program costs shall include reasonable reimbursement from the advance fund account of STATE'S administrative costs, not exceeding 40% of the annual program costs.

c. In the event the STATE underachieves the goals or expenditures agreed upon for the annual operation of the Game Bird Habitat Program, the CORPS may in its sole discretion, notify the STATE of the lagging performance and shortfall in expenditures to achieve the Program's annual goal or other areas of deficiency and allow the STATE a period not exceeding two years to improve and meet the program's objectives. Failure to meet the deficiencies or stated program

objectives within the time specified in the Notice shall result in default and may at the discretion of the CORPS be sufficient cause to terminate this agreement.

d. The CORPS shall not be responsible for any other costs incurred by the STATE or provide any additional monies other than as specified in ART. 6, hereof. The liability of the CORPS is hereby limited to the sum of money advanced to the STATE. The STATE agrees that funding in this manner satisfies the CORPS' responsibility for the game bird stocking portion of the LSRFWCP.

e. Any funds (principal and accured earnings) not expended by the STATE at the end of the 18-year program will be returned to the CORPS.

7. TERMINATION

a. Either party may terminate this agreement by giving at least 90 days advance written notice to the other party. If the termination is for cause set out in ART. 6 c. above, no 90 day advance notice need be given.

b. If the termination is for any reason, prior to completion of the 18 year project life of the program, the STATE shall disgorge and refund to the Government all remaining unexpended sums of money in the advance funds account with accrued interest.

8. EXAMINATION OF RECORDS

a. So far as practicable, the STATE shall keep separate records on all items of expense which will constitute the cost accounting records. The STATE will also maintain a full, complete and accurate record of interest or other investment income earned or accrued to the advance funds provided by the CORPS and separately maintained in advance fund account.

b. The STATE shall maintain books, records, documents, and other evidence pertaining to costs and expenses incurred under this cooperative agreement, to the extent and in such detail as will properly reflect all net costs, direct and indirect, of labor, materials, equipment, supplies and services, and other costs and expenses of whatever nature involved therein. The STATE shall make available at its offices, at reasonable times, the accounting records for inspection and audit by an authorized representative of the CORPS during the period this cooperative agreement is in effect and for three years thereafter.

9. HOLD HARMLESS

The STATE shall hold and save the United States free from damage due to the construction, operation, and maintenance of the Project except where such damages are due to the fault or negligence of the United States.

10. OFFICIALS NOT TO BENEFIT

No member of or delegate to the Congress, or Resident Commissioner, shall be admitted to any share or part of this cooperative agreement, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this cooperative agreement if made with a corporation for its general benefit.

11. COVENANT AGAINST CONTINGENT FEES

The STATE warrants that no person or selling agency has been employed or retained to solicit or secure this cooperative agreement upon agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the STATE for the purpose of securing business. For breach or violation of this warranty, the Government shall have the right to annul this cooperative agreement without liability or in its discretion to the cooperative agreement price or consideration, or otherwise recover, the full amount of such commission, percentage, brokerage, or contingent fee.

12. NON-DISCRIMINATION IN FEDERALLY ASSISTED PROGRAMS

The STATE shall comply with Section 601 of Title VI of the Civil Rights Act of 1964 (Public Law 88-352) and that no person shall be excluded from participation in, denied the benefits of, or subjected to discrimination in connection with the Project on the grounds of race, color, religion, sex or national origin.

13. RELATIONSHIP OF PARTIES

The parties to this cooperative agreement act in their independent capacities in the performance of their respective functions under it, and neither party is to be considered the officer, agent, or employer of the other.

14. TRANSFER OF JURISDICTION

The United States Government may, in its discretion, transfer administrative jurisdiction over its interest in the work herein included and any facilities constructed hereunder to another Federal agency. If such action is taken, the obligations of the Government recognized herein shall continue to be recognized by the successor agency either by assumption of this agreement or by issuance of a new agreement assuming similiar obligations.

15. GOVERNMENT REPRESENTATIVE, POINT OF CONTACT AND MAILING ADDRESS

Mr. Bud R. Van Stone, Chief, Planning Division, Phone No. (509) 522-6588 is hereby designated District Engineer's Representative. Dr. Michael Passmore,

Phone No. (509) 522-6624 is the Point of Contact for all matters covered by this Cooperative Agreement. The official mailing address of the CORPS is as follows:

Corps of Engineers
Walla Walla District
Bldg. 602, City-County Airport
Walla Walla, WA 99362

16. AMENDMENTS

This agreement may be amended or altered by written agreement of the parties, duly executed and attached hereto.

U.S. ARMY CORPS OF ENGINEERS

James B. Royce — Date
Colonel, Corps of Engineers
District Engineer

STATE OF WASHINGTON
DEPARTMENT OF GAME

Jack Wayland — Date
Director