The Northwest Experiment Station News

Published by the Northwest Experiment Station of the University of Minnesota
CROOKSTON, MN April 1991 VOLUME 19, NO. 1

STUDY OF MULTI-PURPOSE IMPOUNDMENT INITIATED

by Dan Svedarsky

A two-year biological inventory study of a newly-constructed impoundment was commenced in 1990 by Station Wildlife Biologist, Dan Svedarsky. The impoundment is part of the Burnham Creek Wildlife Management Area located near Crookston consisting of a 100-acre flood storage pool, an 80-acre restored marsh and over 200 acres of associated upland habitats.

Often, multi-purpose impoundments are constructed to have a variety of benefits such as flood control, wildlife habitat enhancement, water quality improvement, and erosion control, but few data are collected to evaluate these proposed benefits. This study will document the existing water quality and plant and animal life to provide a reference in evaluating future changes, measure the use by migratory wildlife - particularly waterfowl, and develop a long-term management plan which will attempt to balance the objectives of flood control and wildlife habitat. The study will also result in recommendations as to how future impoundments might be designed to maximize various benefits.

The study is a cooperative project funded by the Soil Conservation Service, Red Lake Watershed District and the Nongame Program of the Minnesota Department of Natural Resources. Lead support is from the Northwest Agricultural Experiment Station where Svedarsky has a joint appointment. Local D.N.R. wildlife managers, Ross Hier and Terry Wolfe, assist with sampling aquatic invertebrates, nest searching, and recording the use by migrating wetland birds.

In 1990, a minimum of 114 bird species were recorded at the study site with 52 species breeding. The following species of state-wide, "special concern" status either bred on or within .5 mile of the area: Sandhill Crane, Greater Prairie Chicken, Upland Sandpiper, Wilson's Phalarope, Sharp-tailed Sparrow, American Bittern, and Marbled Godwit. On 23 October, a federally endangered Whooping Crane was observed at the study area along with about 5,000 Sandhill Cranes. The general area is well known as a spring and fall staging area for Sandhill Cranes, but this was one of the few sightings of a Whooping Crane in Minnesota this century. A number of bird watchers converged on the area last fall in hopes of adding this special bird to their Minnesota "life list."

The spring peak in the Sandhill Crane migration was 4,000 on 13 April. Canada Geese peaked at 1,500 on 31 March and around 600 on 8 October. Mallards had a spring peak of about 5,000 on 6 April, another peak of 700 males in the molt migration on 20 June, and then a fall peak of about 5,000 on 21 October.

Nest searching in the uplands is conducted by dragging a cable through potential nesting cover which harmlessly flushes incubating hens. Nests are then marked and later rechecked to determine if the nest successfully hatched. Over-water nests are discovered by field personnel wading through marsh habitats. Table 1 indicates representative wetland birds found to nest on the area. Unfortunately, nest predation was quite high and only 10 of 37 nests successfully hatched with over-water nests experiencing greater success than those in upland sites. Major predators were red fox, striped skunk and raccoons.

The dry conditions of 1990 limited runoff into the study area and it is hoped that the 1991 field season will be marked by more normal precipitation conditions for comparison. Overall, a diverse bird population used the area as well as a variety of mammals. How to maximize wildlife use without compromising flood control benefits will be a major focus as more data are collected this season and the final report is developed.

TABLE 1. SUMMARY OF NEST DATA FOR BURNHAM CREEK WILDLIFE MANAGEMENT

Species	Total Found	Successful
Sora	8	4
Coot	6	2
Blue-winged teal	5	0
Mallard	4	0
Wilson's phalarope	4	1
American bittern	3	1
Pied-billed grebe	3	1
Canvasback	1	0
Virginia rail	1	1
Least bittern	1	0
Harrier	1	0
Total:	37	10

Sampling aquatic insects in the flood storage pool of the Burnham Creek Wildlife Management Area.

SMITH RECEIVES SUGARBEET AWARD

by Allan Cattanach, NDSU

Dr. Larry J. Smith, superintendent of the University of Minnesota, Northwest Experiment Station, (NWES) Crookston, received the 1990 Sugarbeet Distinguished Service Award at the Red River Valley Sugarbeet Growers Association annual meeting in December. The cash award and plaque are provided by the Sugarbeet Research and Education Board of Minnesota and North Dakota.

His association with the sugarbeet industry began in a limited way with a few research trials when he served as Northwest Experiment Station general agronomist for several years. Later he devoted full time to sugarbeet research and education program efforts for nearly six years as sugarbeet agronomist at the NWES.

Since his selection to the position of superintendent of the NWES, he has given leadership to the overall sugarbeet research effort at Crookston. Under his leadership, the sugarbeet research effort has expanded to include extensive research efforts in soil science, IPM, weed control, plant pathology, water quality and cultural practices.

Smith has also helped make the NWES a location for cooperative research efforts on sugarbeets. Drs. A. Dexter, A. Cattanach, J. Giles, J. Moraghan, A. Anderson, D. Cole and numerous graduate students have had research sites at Crookston.

Larry has been personally involved in research on nearly every aspect of sugarbeet production. His personal research efforts of greatest significance have been in N management, cercospora leafspot control and many different cultural practices. He has presented a wide array of educational programs to thousands of growers over the past 15 years.

It can be stated without question that he has made a difference in the success of the Minnesota-North Dakota sugarbeet industry. His efforts have significantly increased the profitability of sugarbeet production in the region.

Larry is nationally recognized for his knowledge of and interest in sugarbeet production.

Smith is or has been a member of the International Sugarbeet Institute Committee, Sugarbeet Research and Education Board, Red River Valley Development Association, Crookston National Bank Board, Northwest Minnesota Initiative Fund, Red River Valley Winter Shows, American Society of Sugarbeet Technologists and the Crop, Soil and Weed Science Societies of America.

Donna Accepts Position In Colorado

Donna Nabben-Schindler was honored at a farewell party in December. Donna joined the Station staff in May of 1986. She resigned from her position as a junior scientist on the sugarbeet project to accept a position with Holly Sugar Corporation, Colorado Springs, Colorado. We all miss Donna's warm, friendly smile. We at the Station wish her and Mike the best of luck in Colorado.

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MALME NAMED EMPLOYEE OF THE YEAR

Recipient of the 5th Annual Employee of the Year Award was Patti Malme, executive secretary.

Patti has been with the Northwest Experiment Station since September 1972. She is the personal secretary to the superintendent of the Experiment Station and coordinates the many clerical services for the superintendent and research staff.

The Employee of the Year Award was designed to promote and recognize excellence in job performance among Civil Service and Bargaining Unit Personnel. Funds for this Award come from a President's Club donation designated for this purpose.

Congratulations, Patti, on receiving the 1990 Employee of the Year Award.

LOOKING BACK OVER 30 YEARS

Marlin O. Johnson, professor emeritus

Last November 30 I retired from the University of Minnesota after 33 years of work with the Minnesota Extension Service. Twenty-seven years were worked in the Red River Valley area--seven in West Polk County as associate agricultural agent (1957-1964) and 20 years (1970-1990) as area crops and soils agent located at the Northwest Experiment Station, Crookston.

My work area was large--from Hallock, Roseau and Baudette on the north to Breckenridge and Fergus Falls on the south.

Wheat, barley and soil fertility were my specialties, however, I've had major programs in sunflower, canola, corn and soybeans from time-to-time.

There were many great times at farm meetings. Sometimes the discussion turned into debate. My favorite size meeting was 20-25 farmers with the classroom being a farm shed or in the field where demonstration was more convincing than words.

Wheat and barley yields more than doubled during this period. In 1956 the average wheat yield was 20-25 bushels per acre. Today 40 bushels per acre is an average crop and 80 bushels per acre is a bumper crop. Three major developments contributing to higher yields were nitrogen fertilizer, wild oat control and improved varieties.

Nitrogen Fertilizer

In 1957, farmers were applying very little nitrogen to their crops. Five to 10 pounds per acre of starter nitrogen (60-80 pounds per acre of 11-48-0) was the standard application with wheat at planting. This treatment was in the ballpark when planted on summer fallow, but left some questions when planted on nonfallow (called old ground in those days).

Earlier research showed that the deep black soils of the Red River Valley area were high in organic matter and, when broken out of sod for farming, provided more than ample nitrogen through organic matter breakdown and soil nitrogen mineralization.

By 1957, however, these soils had been farmed for 60-70 years and the

nitrogen breakdown had slowed and stabilized at much lower levels. Work by the University of Minnesota and North Dakota State University confirmed this in field trials. So, with a new degree in soil science from the University of Minnesota, I went to work.

The late county agent Carl Ash and soils agent Curtis Clint in Ada were a lot of help. Part of Clint's work was conducting field research for the Department of Soil Science. I asked him if we could team up for some nitrogen work in Polk County. He agreed and we set up trials on the John Stromstad farm, Scandia Township, with barley in 1957 and the Ray Larson farm, Tabor Township, with wheat in 1958. The results were dramatic.

The wheat yield increased from 21 to 40 bushels per acre with the 40-pound rate of nitrogen. For $6 per acre of nitrogen there was a $19 net return per acre. Barley yields increased 16 bushels per acre and returned $11 per acre.

We had a meeting at the wheat trial for farmers one evening in mid-July. Farmers had a chance to compare 40 different treatments of N-P-K in combination. The nitrogen treatments stood out with taller, thicker and darker green wheat growth. One of the farmers said, "It looks just like summer fallow."

In addition during the 1958 year, six of our 4-H members in the agronomy project set up nitrogen fertilizer test strips on their 4-H wheat crop. The results were similar and even more dramatic when planted on sugarbeet ground. These plots were viewed by the whole neighborhood at 4-H tour time.

By 1961 the most common fertilizer applied changed from 11-48-0 to 150 pounds per acre of 27-14-0 for wheat and 100 pounds of 27-14-0 for barley.

Weed Control

The biggest thing that happened in weed control was when Carbyne became the first herbicide available for control of wild oats in wheat and barley. Some grain farmers had very serious wild oat problems where yields would be reduced 50 to 60 percent every cropping year.

Farmers with a cultivated crop and along with summer fallow fared better. Some farmers delayed seeding to work up a crop of wild oats before seeding. They usually got hurt by the late seeding and frequently it would only result in a second crop of wild oats. Some farmers harrowed their emerged wheat over and over which sometimes buried some wild oat plants, but usually they recovered along with the wheat. It did destroy emerging broadleaf weeds and foxtail.

Carbyne was the first herbicide that had to be applied with more accuracy than anything they had experienced before. Farmers began to count leaves and some saw the 1 1/2- to 2-leaf stage in their sleep. A short time later Avadex came on the scene. In a period of about five years wild oats were down to manageable levels for most farmers.

New Crop Varieties

Improved crop varieties through plant breeding have made a major contribution to improved yield and grain quality, but also to heading off potential disasters. Some of you remember the serious stem rust problems of the mid-50's that made for a disaster in spring wheat. Canada came to the rescue with the 15B stem rust variety Selkirk. Since then there has not been a serious threat to spring wheat in this region. It could happen but less likely because plant pathologists and breeders are watching for new races of rust and breeding in resistance. Barley has a potential for

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WHEAT ROTATION STUDIES

R.K. Crookston, D.D. Warnes and J.V. Wiersma
University of Minnesota agronomists

The practice of rotating crops has re-emerged as a valuable management option. Recent research with several crops has confirmed a yield advantage from rotation which cannot be overwhelmed by technology or inputs. Also, rotations are receiving renewed attention worldwide as an ideal way to farm with reduced inputs and expenditures.

Most of the recent Minnesota information on rotations comes from corn and soybean studies. Older data from Minnesota and the Dakota's confirmed the value of rotations for cereal production, but we lack data based on current management practices. Older cereal rotations included a legume or meadow crop; modern cereal production systems are not designed to accommodate these.

Cereal-cereal rotations have not been evaluated in Minnesota. Research from the Middle East and North Africa suggests that cereal-cereal (i.e., wheat-oats-barley) rotations may be as yield beneficial as cereal-legume-etc. as long as nitrogen is not limiting.

The primary objective of a recent study we initiated is to characterize the expression and nature of the rotation effect for wheat grown in Minnesota. Because of the study design, valuable information will also be obtained about the effect of rotation on oats and barley, but their inclusion in the study is for the purpose of evaluating wheat.

The first hypothesis to be evaluated is that the "rotation effect" is no more than an interruption of the "monoculture effect." Two other ways to state this first hypothesis are:

-compared to monoculture, wheat will yield better if rotated with any other crop or with fallow.

-rotation of wheat with a legume, or any non-cereal crop, or with fallow, will result in no greater yield benefit to wheat than will rotation with barley or oats (providing nitrogen is not limiting).

The second hypothesis to be evaluated is that a two-year interruption of a wheat monoculture will result in twice as great a yield benefit as a one-year interruption. This fact or response has been documented by Dr. Crookston for both corn and soybeans in Minnesota (results of 11 years of field studies at Lamberton and Waseca).

The results of this study will provide needed and valuable information on the optimal management of wheat rotations in Minnesota. Producers that are looking for ways to reduce their chemical and/or pesticide inputs, or who are simply looking for ways to maximize their wheat yields are already aware of the benefit of interrupting a wheat monoculture, but do not have good information as to which crops will maximize the "rotation effect."

Information is lacking as to whether there is any advantage to a two-year interruption, compared to one year interruption, of a wheat monoculture in Minnesota. Because of its unique design (which allows for a recurring year-by-year evaluation of each rotation pattern selected), this study will provide a solid answer to this question.

The 1990 wheat rotation studies were established at the Northwest Experiment Station at Crookston, the West Central Experiment Station at Morris, and the Rosemount Experiment Station. These studies contain the following rotation patterns, or 21 treatments:

monoculture

- a continuous monoculture of wheat-oats-barley.

annual alternations, or two-year rotations

- an annual alternation of wheat and barley.
- an annual alternation of wheat and oats.
- an annual alternation of barley and oats.
- an annual alternation of wheat and fallow.
- an annual alternation of wheat and soybeans.
- an annual alternation of wheat and canola.

three-year rotations

-a three-year rotation of wheat-barley and oats, with each crop appearing in that sequence every year.
-a three-year rotation of wheat-oats and barley, with each crop appearing in that sequence every year.

Wheat is the principal crop; barley and oats are secondary. Soybeans and canola are included in the study, but are considered set-up crops. All crops are managed for optimum yields. The design of the wheat rotation patterns in this study should provide an in-depth evaluation of the nature of the wheat rotation effect.

John Moves To St. Paul

John Lamb, soil scientist at the Northwest Experiment Station since July 1984, resigned to accept a position as soil scientist of the Management System Evaluation Area with the Northern Cornbelt Sand Plains project at the St. Paul campus. We miss John and especially his computer experience, but we wish John, JoAnne and Christine the best of luck in the Twin Cities.

IN-RESIDENT PH.D. CANDIDATE COMPLETES DEGREE

by Carol Windels, Plant Pathologist

Gradate students are not new to the Northwest Experiment Station. Many students working for a masters or doctoral degree on the St. Paul campus periodically visit the Station to collect a portion of their thesis data from research plots of various crops or the dairy project. Often their faculty advisors, located at the St. Paul Campus, conduct ongoing projects at the Station.

In 1988, the Northwest Experiment Station tried a new approach to graduate student training - an "in-resident" graduate student. Cheryl A. Engelkes moved to Crookston in June, 1988 to begin her field research as a **doctoral candidate in plant pathology.**

Under this arrangement, Cheryl spent the last three summers at Crookston. The remainder of each year was spent in St. Paul taking classes and continuing research projects in the greenhouse and laboratory. Requirements for her doctoral degree will be completed in April, 1991. She is co-advised by Dr. Carol E. Windels, Plant Pathologist at the NWES, and Dr. Neil Anderson, Department of Plant Pathology, St. Paul.

Cheryl's thesis research has examined the host range of the fungus Rhizoctonia solani, which causes root and crown rot on sugarbeet. She also determined how long the pathogen persists in soil. Her research is providing an understanding of the epidemiology of Rhizoctonia root and crown rot of sugarbeet in the field. The information is helping to explain why severity of the disease varies among seasons and among fields. Her work has resulted in several important conclusions.

One of the significant results of her research is the discovery that the population of R. solani that attacks sugarbeet also causes root and stem rot of bean crops including: soybean, navy bean, fababean and pinto bean. When soybean was planted in plots in which Rhizoctonia-infested sugarbeet roots were incorporated into soil two years earlier, 5% of the soybean roots were infected with R. solani. Sometimes the infected soybean roots were rotted. In some cases, R. solani was present on soybean roots with no root rot symptoms. Thus, in fields where Rhizoctonia root rot is a problem, close rotation of bean crops and sugarbeet should be avoided. Rotation of sugarbeet and bean crops year after year can result in a build-up of the pathogen even in fields where Rhizoctonia is not considered a problem. Crop rotation with a "nonhost" crop, such as cereals is considered the best way to allow populations of R. solani to decline in soil in the absence of a sugarbeet and/or bean crop.

A second portion of Cheryl's research determined that the population of R. solani that causes root rot on bean and sugarbeet crops differs in pathogenicity. Some cultures of the fungus are extremely aggressive and cause severe disease. Other cultures of the fungus are less aggressive and cause less disease. All varieties of bean crops that were evaluated were susceptible to Rhizoctonia root rot. Most varieties of sugarbeet also are susceptible to Rhizoctonia, except for a "specialty" variety that has some tolerance to the disease. Less disease developed on the specialty sugarbeet variety compared to the commercial variety when roots were inoculated with cultures of R. solani originally isolated from diseased sugarbeet roots. However, most of the cultures of R. solani originally isolated from roots of diseased soybean and pinto bean were so aggressive that they caused equally severe root rot on both the commercial and the specialty sugarbeet varieties. This may explain why planting a specialty variety with tolerance to Rhizoctonia occasionally results in less than satisfactory disease control.

A third result of Cheryl's research is that sugarbeet roots of all ages are susceptible to infection by R. solani. Seedlings and young roots are especially susceptible. Sugarbeet roots become less susceptible as plants mature, especially the root rot tolerant variety. However, the age of plants at time of infection appears to have less effect on the severity of Rhizoctonia root and crown rot than does the duration of temperatures favorable for disease development (75-85° F) following infection. Disease severity is primarily determined by favorable temperature conditions and moist soil.

Cheryl is a native of Adrian, MN and grew up on a corn and soybean farm. She has a B.S. degree (with distinction) from the University of Minnesota with majors in Plant Health Technology and Horticulture and a M.S. degree from Michigan State University in Horticulture. She is a member of several honor societies and has been awarded numerous scholarships. Her graduate student stipend has been funded jointly by the NWES and the College of Agriculture, University of Minnesota. Research funds were provided by the Sugarbeet Research and Education Board of Minnesota and North Dakota.

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stem rust that surfaced during the 1990 cropping season.

The most noteworthy variety released over the past 33 years was Era spring wheat. It was released in controversy mostly because of lower protein content than desired for this spring wheat growing region. It did, however, offer high yield and did very well under a wide range of growing conditions. It also held its kernel and lended to straight combining. Farmers liked it because it was the highest yielding wheat they had ever grown. Eighty to 90-bushel yields were realized by some farmers.

By 1974, 70 percent of the wheat acreage grown in Minnesota was of the variety Era. It moved into the milling trade and sold very well in the export market. It's still a good wheat but improved varieties like Vance offer yield and quality advantage. Era was recently removed from the recommended planting list after 16 years.

Meet the Staff. . .

During the past 17 years, all of the research scientists have been introduced to our readers. However, the support of the Civil Service and Bargaining Unit employees is very important to the operation of the Station. In this issue we feature the **Dairy Department**.

The **Dairy Department** consists of six full-time employees and several work study students. The crew is headed by **Marlyn Jacobson**, assistant scientist. Marlyn was born and raised at Spicer, Minnesota. He is a graduate of the University of Minnesota, and joined the Experiment Station staff in November, 1966. Marlyn is a herdsman and assists Dr. George Marx in the collection of research data. Marlyn and his wife, Marlys, a travel agent in downtown Crookston, have 3 children: Mike, Mark, and Monica. Marlyn's hobbies include hunting and fishing.

David Szczech, a farm animal attendant, was born and raised near Foley, Minnesota. A graduate of UMC, Dave joined the dairy crew in October 1974. Dave is the assistant herdsman. He feeds the animals, keeps records, and fills in for whoever is not working that day. Dave and Janice, a unit manager for the Polk County Group Homes, have 5 children: Chuck, Joe, Amanda, Ryan and Samantha. Dave's hobbies include bowling, softball and when he gets a chance, fishing.

Philip Thom, was born and raised on a farm in Norman County. Phil, a farm animal attendant, attended the University of Minnesota, and was employed at the St. Paul campus. He transferred to Crookson in 1985. Phil is the PM milker, which means he is responsible for the evening milking which begins about 3 p.m. He is also responsible for calf raising. If you see a large dog riding around with Phil, it's because he raises chocolate Labradors. He enjoys hunting, fishing, and woodcarving. Phil commutes from Ada each day.

Jim Broekemeier, a farm animal attendant, began working at the Experiment Station in 1973 while a high school student. Jim was born and raised in Crookston. He attended Bemidji State University. Jim is the AM milker. His day begins early - 3 a.m.! Jim is also responsible for calf raising. Jim and his wife, Karen, are parents of an 8-month old daughter, Tayler Leigh. When not working, Jim likes to spend time playing softball and volley ball and hunting and fishing.

Rod Wegge, started at the Experiment Station in May 1987, as an assistant farm animal attendant. Rod is responsible for feeding and caring of the dairy animals. Rod was born and raised on a farm near Nielsville and graduated from Climax High School. He enjoys family activities with his wife, Kim, and son, Casey, 10 and daughter, Lindsay, 7. Rod commutes from Nielsville each day.

Joe Larson started at the Experiment Station in January 1987 with the beef and sheep project. He transferred to the dairy department last summer. Joe, an assistant farm animal attendant, was born and raised on a farm near Euclid. He graduated from Crookston Central and UMC. Joe's responsibilities include some milking, feeding and cleaning. Joe enjoys hunting, fishing, golfing and raising sprint cars in his spare time.

The dairy crew does an excellent job of handling the dairy project.

*The **dairy crew**: David Szczech, Marlyn Jacobson, Rod Wegge, Joe Larson, Phil Thom and Jim Broekemeier.*

The Northwest Experiment Station News
Issued by

THE UNIVERSITY OF MINNESOTA
NORTHWEST EXPERIMENT STATION
Crookston, Minnesota 56716

Patti Malme, Associate Editor

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