

HORTICULTURAL DEMONSTRATION PLANTINGS
ON THE NAVAL COMPLEX, ADAK, ALASKA

Prepared by

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Introduction

History

There are no reports of indigenous trees growing on the Aleutian Islands. The first recorded attempt to plant trees in the Aleutian Islands occurred in 1805 (Bruce 1985, USDI ND). Two to three year old Sitka spruce seedlings were believed to have been brought to Unalaska from Sitka in 1805. In 1977, the six surviving trees averaged 36 feet in height (Bruce 1985). During World War II an aggressive tree planting program was undertaken by U. S. military forces on the Aleutian chain (Bruce 1985, Bruce and Court 1945, USDA 1990, USDI ND).

The most successful planting on Adak is popularly known as the "Adak National Forest". It was planted in 1944 or 1945 (Bruce 1985, USDA 1990). The Sitka spruce in the stand averaged 10.6 feet in height in 1984 (USDA 1990). Most stands of spruce trees planted in open areas grow very slowly and remain stunted for several years (Figure 1) (Bruce 1985).

Many research programs and proposed planting plans have attempted to identify the best adapted tree species and transplanting techniques for Adak (Bruce 1985, USDA 1990, USDI ND). Bruce and Court (1945) proposed that the factors which may limit tree growth in the Aleutian Islands are insufficient summer warmth, insufficient summer sunshine, excessive winds and possibly improper soil conditions.

Climate

The maritime climate of Adak Island (51° 45' N, 176° 45' W) is characterized by high winds, overcast skies and very cool summers (USDA 1990, USDI ND). Despite the relatively long, frost-free period for the Aleutian Islands, 130 to 190 days (Bruce and Court 1945), the mean annual temperature on Adak is relatively low (USDA 1990, USDI ND). The mean monthly temperature varies from a low of 32.9° F in February, to a high of 51.3° F in August. The mean monthly temperature is above 50° F for only one or two months each year. At least four months with a mean temperature above 50° F has been suggested as the minimum required for tree growth (Bruce and Court 1945).

Adak receives a mean annual precipitation of approximately 64 inches. The lowest average monthly rainfall periods are



Figure 1. The open habitat of an earlier spruce planting

in June and July with an average of three inches. Peak periods of rainfall are in November and December with an average of seven to eight inches. The island averages over 100 inches of snowfall per year between December and March. The snow depth rarely exceeds one to two feet and is concentrated in the mountains (USDA 1990).

The island can be battered by storms at any season. The most severe and frequent storms occur in the winter months. High winds are frequent in both summer and winter months. Winter winds have been recorded with gusts of over 100 knots/hour and summer wind gusts of over 50 knots/hour. The average wind velocity is 15 knots/hour (USDA 1990).

1991 Horticultural Demonstration Plantings

The Horticulture Demonstration Plantings were designed to demonstrate which introduced and native plants are suitable for landscaped or garden areas around the Naval Complex, Naval Air Station (NAS) facilities and residential housing units. A comprehensive list of ornamental plants and plants native to other areas of Alaska which will survive on Adak has not been compiled. The results of these plantings can be used in the formation of such a list.

Introduced ornamental plants were included in the project because of comments received from NAS staff and residents in September 1989. As with some of the past projects, it was thought that the growth of familiar plants near the Naval facilities would help to build the morale of those residents having difficulty adjusting to the environment of Adak.

This project differed from those of the past (Bruce 1985, Bruce and Court 1945, USDA, SCS 1990, and USDI, FWS ND) in that shrubs, herbaceous perennial plants and bulbs were included in the plantings. Very few tree species were planted with this project. The location of the planting sites in this project also varied from past projects. Planting sites were located near Naval facilities rather than away from the buildings in open habitats.

Site Selection

Sites for the landscaped areas were identified in discussions with the Commanding Officers of NAS, Naval Facility (NAVFAC), and Naval Security Group Activity (NSGA) or their representatives, Mr. Stoney Wright, Manager, Alaska Plant Materials Center, Mr. Bradely Posadas, Engineering Director, NAS Adak, and Mrs. Marge Fabre, Director of Housing, NAS Adak. Factors which were considered in site selection included: protection from the wind where possible, soil conditions, aspect, proximity to facilities, and interest in participating in the project.

The selected sites included the Housing Office, Adak Museum, Medical Building, Child Development Center, NSGA Administration Building and three additional sites at NSGA, NAVFAC Administration Building, Marine Company Barracks, (MCSF) and the U.S. Fish & Wildlife administration building. Maps of the planting areas are on file at the Alaska Plant Materials Center and the Public Works Department.

Demonstration plantings were planted in late May. Plants were distributed in late May and June to individual residents through the Housing Self-Help and plants were left with Mr. Eb Pope for distribution by the Kiwanis. Tulips, daffodils and other assorted bulbs were distributed on Saturday, September 28, from Housing Self-Help. The housing office and Alaska Plant Materials Center has a record of which residents received plants.

Plant Selection

Plants were selected based on probability of their survival on Adak. Several sources were used to make the selections. A preliminary trip to Adak in September 1989 provided valuable information to make plans for the project. Information to make the selections was taken from the Natural Resources Management Plan, Naval Complex, Adak, Alaska; Louise Stack, Horticulturist, University of Maine Cooperative Extension Service, and the references listed.

Landscape development on Adak is unique because of challenging environmental conditions and the concern about introducing exotic species into the natural ecosystem. These factors were considered when the plants were selected for the project. The information that is available demonstrates that it is unlikely that an introduced plant species will establish a reproducing population which will compete with the natural ecosystem.

Native and introduced species were planted in the project. The majority of the plants used were introduced species. Introduced species are more readily available from the nursery industry at this time and have been planted in the landscaped areas around new buildings on Adak. They will continue to be used because of the flowering or design characteristics they can add to the landscape and their availability.

Plants native to Adak and other areas of Alaska should also be used in landscaped areas of the Naval facility. They could be used more frequently as they become more readily available from commercial nurseries.

Twenty-eight different tree or shrubs were planted. The majority of the woody species planted in the project were mid to low growing shrubs (Table 1). Two taller species, chokecherry and beach plum, were planted. Chokecherry was planted because of its performance in harsh climates in Alaska and the beach plum was recommended because of its performance in northern Maine.

Duplicates of a few species were ordered from an Alaska nursery and a nursery outside of Alaska to observe if there may be a difference in the survival of the plants from the two different locations. Many factors affect plant survival and acclimation which makes a comparison between two sources difficult and less than accurate. A few of those factors include the size difference in the plants when planted in Adak, the length of time between being dug at the nursery and planted at Adak and the condition of the plant when it was dug at the nursery. Despite these factors, a trend for a difference in survival may be apparent among the plants.

All of the trees and shrubs, except the juniper, were brought to Adak as bare root nursery stock. Bare root nursery stock is easier to transport to remote locations such as Adak. If bare root stock can be successfully transplanted on Adak it may be a more reasonable way for the self-help warehouse and residents to have plants brought to the island.

Native and introduced flowering herbaceous plants are grown around several of the residences on Adak. They are popular because of the color and form they contribute to the landscape. Perennial and annual, herbaceous plants help to add an element of landscape design provided by woody trees and shrubs in other areas.

Table 1. Woody plant species planted in the Horticultural Demonstration Plantings.

Scientific Name	Common Name
<u>Amelanchier alnifolia</u> +	Serviceberry
<u>Amelanchier alnifolia</u> 'Regent'	Regent Serviceberry
<u>Caragana arborescens</u>	Siberian Peashrub
<u>Cornus</u> 'Siberian'	Siberian Dogwood
<u>Cornus stolonifera</u> +	Redosier Dogwood
<u>Cotoneaster acutifolius</u> *	Peking Cotoneaster
<u>Cotoneaster Sungarica</u>	Cotoneaster
<u>Juniperus scopulorum</u>	Rocky Mt. Juniper
<u>Lonicera</u> 'Arnold Red'	Arnold Red Honeysuckle
<u>Lonicera x xylosteoides</u> 'Clavey's Dwarf'*	Claveys Dwarf Honeysuckle
<u>Lonicera x xylosteum</u>	Honeysuckle
<u>Lonicera</u> 'Mini Globe'	Mini Globe Honeysuckle
<u>Myrica gale</u> var. <u>tomentosa</u> +	Sweet Gale
<u>Pinus contorta</u> +	Lodgepole Pine
<u>Potentilla fruticosa</u> 'Abbotswood'	Abbotswood Cinquefoil
<u>Potentilla fruticosa</u> 'Goldfinger'*	Goldfinger Cinquefoil
<u>Potentilla fruticosa</u> 'Jackmannii'	Jackmanni Cinquefoil
<u>Potentilla fruticosa</u> 'Coronation Triumph'	Coronation Triumph Cinquefoil
<u>Prunus besseyi</u>	Sand Cherry
<u>Prunus maritima</u>	Beach Plum
<u>Prunus virginiana</u>	Chokecherry
<u>Ribes</u> sp.+	Alaska Native currant
<u>Rosa rugosa</u> 'Hansa'	Hansa Rose
<u>Sorbaria sorbifolia</u>	False Spiraea
<u>Spiraea x vanhouttei</u>	Bridal-wreath Spirea
<u>Symphoricarpus</u> 'White Snowberry'	Snowberry
<u>Syringa meyeri</u>	Dwarf Korean Lilac
<u>Syringa x prestoniae</u> hybrids	Lilac

* Plants from two sources were planted of marked species. One source was an Alaska nursery and a second source was a nursery outside of Alaska.

+ Plant species native to Alaska, not necessarily Adak.

Thirty-four different herbaceous plants were planted in this project (Table 2). Perennials which survive under severe conditions were planted on Adak. Many of the varieties represent genera native to Adak. The 'Gallery' lupine is one of the varieties representing a genus native to Adak (Figure 2).

Tulip and daffodil bulbs are also grown by the residents of Adak. Daffodils and tulips were in bloom in local gardens in late May. Thirty-two varieties of bulbs were planted in September on Adak (Table 3). There are many different genera of bulbs which potentially may grow on Adak. Crocus, ornamental onions, Allium, autumn crocus, Colchicum, and glory-of-the-snow, Chionodoxa, were planted in addition to tulips, daffodils and narcissus. Use of a greater variety of bulbs could expand the length of time flowers are in bloom around the developed areas of Adak.

Native plants were incorporated into the demonstration plantings if they were available at the site being planted. Existing native plants were utilized at the Adak Museum, NSGA and Bering Hill complexes.

Table 2. Herbaceous plant species planted in the Horticultural Demonstration Plantings.

Scientific Name	Common Name
<u>Achillea millefolium</u> + 'Summer Pastels'	Summer Pastels Yarrow
<u>Achillea millefolium</u> + 'Cherry Queen'	Cherry Queen Yarrow
<u>Anemone blanda</u> White Rose Red Blue	Windflower
<u>Aquilegia</u> hyb. 'Biedermeier'	Biedermeier Columbine
<u>Aquilegia flabellata</u> 'Blue Fan'	Blue Fan Columbine
<u>Aquilegia</u> hyb. 'Dragonfly'*	Dragonfly Columbine
<u>Artemisia stelleriana</u> + 'Silver Moon'	Silver Moon Dusty Miller
<u>Aster alpinus</u> + <u>Aster tongolensis</u>	Alpine Aster Aster
<u>Dicentra spectabilis</u>	Bleeding-Heart
<u>Heuchera sanguinea</u> 'Coral Bells'	Coralbells
<u>Iris setosa</u> + <u>Lilium</u> sp. 'Haydee' 'Enchantment' 'Crete' 'Rhodos' 'Antarctica'	Wild Flag or Wild Iris Lily Haydee Lily Enchantment Lily Crete Lily Rhodos Lily Antarctica Lily
<u>Lupinus</u> 'Minarette Mix' <u>Lupinus</u> 'Gallery'	Minarette Mix Lupine Gallery Lupine
<u>Papaver orientale</u> 'Allegro' <u>Papaver</u> 'Champagne Bubbles'	Allegro Poppy Champagne Bubbles Poppy
<u>Phlox paniculata</u> <u>Ranunculus</u> Gold Pink Red Rose Sunset White	Garden Phlox Mix Ranunculus
<u>Veronica incana</u> <u>Veronica latifolia</u> <u>Veronica spicata</u>	Woolly Speedwell Royal Blue Speedwell Spike Speedwell

* Plants from two sources were planted of marked species.
One source was an Alaska nursery and a second source was a nursery outside of Alaska.

+ Plant species native to Alaska, not necessarily Adak.



Figure 2. A 'Gallery' Lupine plant blooming at a residence in the Bayshore residential complex

Table 3. Bulbs planted in the Horticultural Demonstration Plantings.

Species/Cultivar	Flower Color	Height
<u>Allium moly</u>	yellow	8-12
<u>Allium neapolitanum</u>	white	8-12"
<u>Allium ostrowskianum</u>	magenta	8-12"
<u>Chionodoxa luciliae</u>	white	5-8"
'Alba'		
<u>Chionodoxa luciliae</u>	blue	5-8"
'Gigantea'		
<u>Colchicum speciosum</u>	lilac-pink	8-10"
'Waterlily', Autumn Crocus		
<u>Crocus chrysanthus</u>	yellow and blue	4"
Snow Crocus		
<u>Crocus chrysanthus</u>	blue	3-5"
'Blue Bird', Crocus		
<u>Crocus vernus</u>	mix	
Giant Crocus		
<u>Eranthis hyemalis</u>	yellow	3-6"
Winter aconite		
<u>Galanthus nivalis</u>	white	3-8"
'Simplex'		
<u>Narcissus</u> 'Carlton'	yellow	18"
<u>Narcissus</u> 'Debutante'	pink/white	15"
<u>Narcissus</u> 'Delibes'	orange/yellow	18"
<u>Narcissus</u> 'Dove Wings'	yellow/white	12"
<u>Narcissus</u> 'Ice King'	yellow/white	16-18"
<u>Narcissus</u> 'Palmares'	pink/white	16-18"
<u>Narcissus</u> 'Salome'	apricot/white	14"
<u>Narcissus</u> 'Tete-a-Tete'	yellow	6-8"
<u>Scilla siberica</u>	blue	4-6"
'Spring Beauty'		
<u>Tulipa</u> 'Apricot Beauty'	apricot	14-15"
<u>Tulipa Fosterana</u>	yellow	16-18"
'Sweetheart'		
<u>Tulipa patens tub.</u>	red	9"
Firespray Tulip		
<u>Tulipa</u> 'Oscar'	red	18"
<u>Tulipa</u> 'Color Magic'	white to pink	18-20"
<u>Tulipa</u> 'Peer Gynt'	rose	18"
<u>Tulipa</u> 'Don Quixote'	magenta	20-22"
<u>Tulipa</u> 'Red Apeldoorn'	red	20-24"
<u>Tulipa</u> 'Apeldoorn Elite'	gold/red	20-24"
<u>Tulipa</u> 'Wild Plum'	blue	16-18"
<u>Tulipa</u>	yellow	20-24"
'Golden Apeldoorn'		
<u>Tulipa</u> 'White Swallow'	white	20"

Planting Procedures

Planting areas were situated where they would receive as much protection from the wind as possible. Additional wind protection was provided by building plastic shelters around the plants at some planting sites (Figure 3). Three-foot or four-foot stakes, reinforced plastic and duct tape were used to build the shelters. A commercially available product, 'Wall-O-Water', was distributed to some residents to use for wind protection. The protection is intended to be used during their first growing season. The shelters create a warmer microclimate for the newly planted plants in addition to providing wind protection.

Planting instructions for trees and shrubs were distributed in the spring with the plants (Appendix A). The plants were planted in the existing soil without any organic soil amendments. The demonstration sites, with one exception, were fertilized with 8-32-16 fertilizer at planting. Four ounces of fertilizer was mixed into the top layers of soil in the planting hole.

The question of whether to fertilizer at planting or one year later after the plants have been established has been discussed in recent years. A trial to determine the best time to fertilize plants on Adak was planted at the NAVFAC site. Potentilla fruticosa 'Jackmannii' plants received three treatments. One group of plants will be the control and receive no fertilizer, a second group was fertilized at planting with 4 ounces of 8-32-16 fertilizer and the third group will be fertilized with 4 ounces of 8-32-16 fertilizer in 1992.

All plants were watered-in at planting time to settle the soil and provide the moisture necessary for the roots to initiate growth and become established. Those responsible for the demonstration plantings at each facility were asked to water the plants if rainfall was not adequate to keep the root ball moist. The plants should be kept well watered throughout their first growing season (Grainger ND). Residents were instructed to water their plants well after planting and to water them throughout the growing season.

Residents also received planting instructions for the bulbs when they were distributed in September (Appendix A). The instructions were those distributed by one of the companies supplying bulbs for the demonstration plantings.



Figure 3. Planting area with temporary protection from the wind constructed around each plant

Data Collection

A data base is being developed to track the growth and success of the demonstration plantings. Information sheets were developed for residents to record the growth characteristics of the trees, shrubs, and perennials (Appendix B). The program dBase IV is being used for the data base.

September 1991 Observations & Activities

The demonstration plantings were evaluated the last week of September. Height, width, percent die back, and whether the plant had bloomed or set a flower bud were among the growth measurements evaluated. Those plants which had received adequate moisture during the summer performed the best. Many of the perennial plantings were damaged or destroyed during an extensive clean-up for a late summer inspection.

Most of the perennials had flowered or set flower buds by late September. The ranunculus were the only perennials which did not grow in the public demonstration plantings. As expected, the growth rate of the perennials was slower on Adak than that found in southcentral Alaska. Some species grown as perennials elsewhere may have to be grown as annuals on Adak. Those species which can grow as perennials will be determined after they have successfully overwintered.

The trees and shrubs had leafed out and a few had flowered or set flower buds by late September (Figure 4). Several factors had an impact on the survival of the newly planted trees and shrubs. The effects of the dry period in the early summer of 1991 and lack of wind protection were seen on several of the trees and shrubs in the form of 25% to 50% die-back. A few of the plants had died by September. A more comprehensive list of plants for Adak can be compiled after the demonstration plantings have successfully overwintered.

The care and the storage facilities for the bare root nursery stock prior to being planted also have an effect upon survival. The nursery stock was stored in the self-help warehouse until it could be planted. An effort was made to keep the root systems of the plants moist by wetting the mulch around the roots and wrapping them in plastic to keep the humidity high. A preferable storage area would be an outside bed where the bare root nursery stock could be heeled-in and protected from the wind until transplanted.

Plants whose root systems are allowed to dry out before being transplanted will not survive as well as those properly stored.

A holding area for nursery stock could be built between the self-help warehouses if nursery stock is brought to Adak for future projects. Both bare root and container stock could be held in that area to begin acclimation to the growing conditions of Adak.

The incorporation of an organic material; peat moss, top soil or compost, into the planting areas would improve the growth and survival of the landscape plants. Many of the areas around the buildings have been backfilled with sand or compacted gravel. The plants growing in areas with some organic matter performed better than those in poorer sites. A limited amount of organic material is available on Adak and the recommended amounts to incorporate into the planting area may have to be lower than that conventionally used. The addition of some organic matter, however, should still be beneficial to plant growth and survival.



Figure 4. A Potentilla fruticosa 'Goldfinger' plant fully leafed out with flower buds in front of the Housing Office

A nursery area for native plants was established in September 1991. Two raised beds were built between the self-help warehouse buildings and filled with native soil. Plants of several native species were dug from disturbed areas and transplanted to the beds or containers. In addition to the raised bedding, a bale of peat-lite potting soil and four-inch pots were shipped to Adak in October to develop a container nursery.

These plants can be used as stock or parent plants for propagation purposes in the future. Aster, lupine, yarrow, sandworts, siebaldia and willows were among those species transplanted.

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Appendix A
Planting Instruction Handouts

CARE AND PLANTING OF TREES AND SHRUBS

Care of Trees and Shrubs

Keep the roots wrapped in plastic or in the container until immediately before planting to protect the delicate roots. Set it upright in a shady spot and protect from extreme temperatures, high winds and direct sunlight. Plant the plant as soon as possible. You will need to water the plant every few days to keep the roots moist.

Ground Preparation

Trees love sunshine, so choose a sunny place for it to grow in. Prepare a planting area larger in diameter than the root system by using a shovel to loosen the soil. Loosen as deep as the length of the roots. If available, you may add organic matter if you spread it evenly throughout the area. Dig a hole in the center of the planting area, the same depth as the root system.

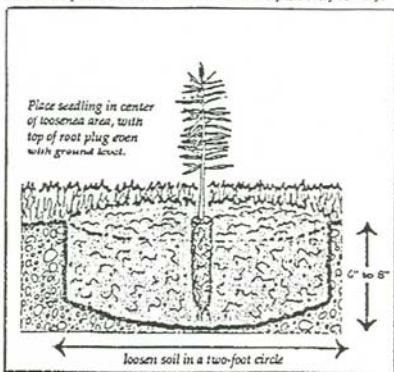
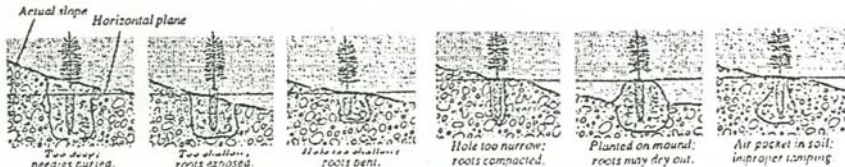
Planting the Seedling

Place the plant into the hole so the plant is at the same level it was grown at in the nursery. It is very important to not bury the root deeper than originally grown. While holding the tree at the proper level, push the loose soil in around the roots. Make sure the roots go straight down. Firm the soil around the roots with your hand so that there are no air pockets. Watering lightly will help settle the soil. A two to three inch layer of grass clipping could be used as a mulch if desired.

Water and Fertilizer

Water the seedling after planting and then as needed to keep the soil from drying out. The best time to fertilize on Adak has yet to be determined.

Avoid These Common Planting Errors:





White Flower Farm

PLANTSMEN

WINTER PROTECTION OF PLANTS

1. Plant promptly according to the directions specific to the plant you are handling. If no specific information is given for your plant, follow general instructions. Delay at this time of year can be costly as the roots need time to become firmly established before cold weather settles in.

2. Water generously at planting time to settle the soil about the roots. Usually fall weather is damp and cool enough so that additional watering is not necessary. Too much soil moisture at this time of the year can be harmful, since it prevents natural hardening off and does not encourage the plants to develop deep root systems. If you experience dry weather, scratch away the soil surface rubble and check the moisture level at about 1" deep. If watering is found to be necessary, apply infrequently, no more than once a week, and in sufficient volume (about 12") to penetrate the soil deeply, to about 12".

3. If you fertilize, do so after several hard frosts.

4. After the ground freezes, cover all plants that have been planted in either the spring or fall with 4-5 inches of a light insulating material such as straw, salt marsh hay, oak leaves or pine needles. Spruce or pine branches can also be used for protection. Do not use wood chips, bark nuggets, cocoa hulls, buckwheat hulls or other materials that tend to pack and freeze, which prevents proper drainage.

5. Please note that bearded iris is an exception to the above. After planting, cover the rhizomes with 2 inches of bank sand (builder's sand). This can be washed or brushed off in spring.

6. Mouse bait and wire mesh may be advisable to prevent rodents from feeding on bulbs and crowns.

7. Remove winter cover gradually in the spring when the daffodils bloom, earlier for spring flowering bulbs.



**On Adak, snow will provide the best mulch.

Bulb planting and care instructions

Appendix B

Data Base Information Sheets

Tree, shrub and perennial data information sheet

NAS, Adak Plant Trial Project

Participants Name or Site: _____

Physical location where planted: _____

Mailing Address: _____

Phone Number: _____

Your expected departure date from Adak? _____

Tree or Shrub Name: _____

Accession Number: _____

Date Planted: _____ Number Planted: _____

Did your plant survive the 1991 summer? Yes No

Did your plant bloom in 1991? Yes No

What month or months? _____

What was the flower color? _____

Did your plant survive the 1991-1992 winter? Yes No

Did the plant die back during the winter? Yes No

Percent of plant which died back (please circle): 25%

50% 75% 100%

If the plant died back, did the plant regrow from the roots

in 1992? Yes No

Herbaceous plant name: _____

Accession Number: _____

Date Planted: _____ Number Planted: _____

Did your plant survive the 1991 summer? Yes No

Did your plant bloom in 1991? Yes No

What month or months? _____

What was the flower color? _____

Did your plant survive the 1991-1992 winter and regrow in

1992? Yes No

Bulb Data Information Sheet

NAS, Adak Plant Trial Project

Participants Name or Site: _____

Physical location where planted: _____

Mailing Address: _____

Phone Number: _____ Departure date from Adak? _____

Name of Allium (ornamental onion): _____

Name of Crocus: _____

Name of Daffodil or Narcissus: _____

Name of Tulip: _____

Name of other type of bulb: _____

Date Planted: _____ Number Planted: _____

Did your bulbs survive the 1991-1992 winter? Yes No

Did your bulbs bloom in 1992? Yes No

What month or months? _____

What was the flower color? _____

Did your bulbs survive the 1992-1993 winter and bloom in 1993? Yes No What month or months? _____