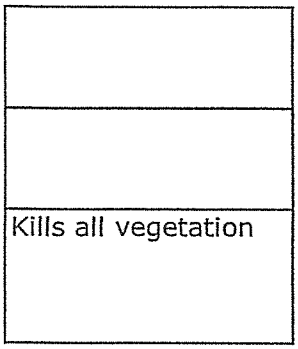
Gearhart Foredune Noxious Weeds

Species	Presence	Method	Material	Timing
Scots Broom, Cytisus scoparius (Fabaceae)	Extensive patches bewteen city and first dune crest to west; few widely scatter clumps farther west	Mow; let regrow (2-3 years); spray; repeat	Garlon 4 (upland, oil-based formula)	Mow fall-winter; spray summer-early fall
Bull thistle, Cirsium vulgare (Asteraceae)	Numerous small clumps throughout site	Several herbicides work well; might take several treatments	Milestone	Summer, pre and during flowwering
Canada thistle, Cirsium arvense (Asteraceae)	Few small clumps throughout site	See above	See above	See above
Tansy ragowort, Jacobaea (Asteraceae)	Numerous plants across entire site; most easily seen and pulled when flowering	Hand pull when in flower		Find and pulll when in flower
Himalayan blackberry, Rubus armeniacus (Rosaceae)	Scattered small plants, several large thickets	Mow, then let resprout, spray; repeat if needed	Garlon 4 (upland, oil-based formula)	Mow fall-winter; spray fall
Cut-leaf blackberry, Rubus lacinatus (Rosaceae)	Scattered small plants	See above	See above	See above
Japanese knotweed, Fallopia japonica (Polygonaceae)	One clump near Pacific Way on west slope of dune	Spray; or hand pull all shoots 2x per year for up to 3 -4 years to remove plants completely	Imazapyr, 6 py/acre (1% solution)	Summer, full leafout. Need to confirm species; Bohemian knotweed is much harder to remove; check young leaf hairs in spring to determine which species
Atlantic Ivy, Hedera hibernica (Aquifoliaceae)	Scattered vines, on trees	Pull small vines out of ground; cut large vines down, treat bases		

English holly, Ilex aquifolium	Scattered small to large trees	Cut down trees, shrubs, treat bases		
Cotoneaster species (Rosaceae)	Scattered plants	Cut down, treat bases		
Bamboo	Patch along north side of city park	Spray, let die down, mow, repeat	Imazapyr, 6 py/acre (1% solution)	

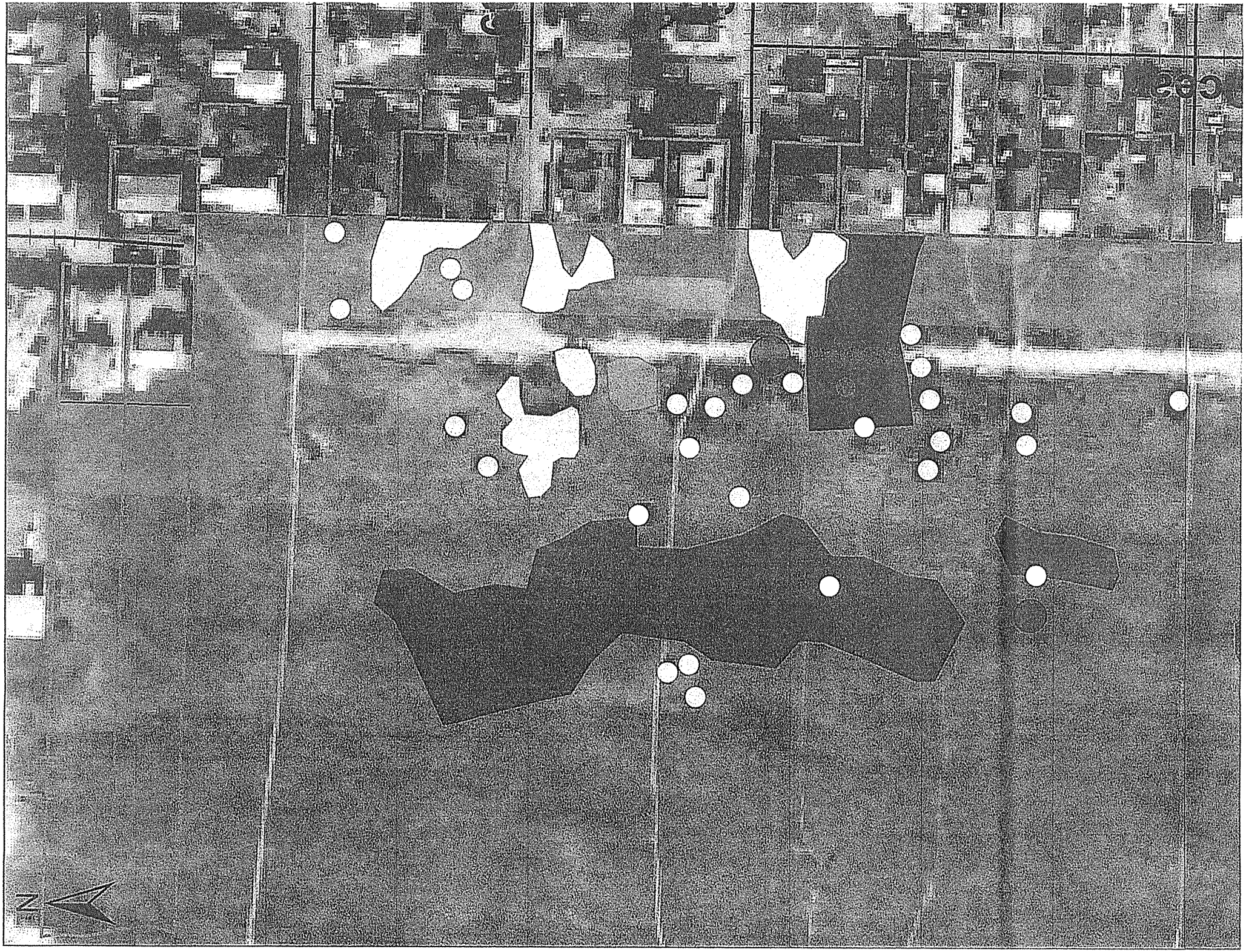
Other
Leaves grasses alone; will kill other dicots
Milestone is an upland formula, leaves grasses alone; can leach into groundwater, water soluble formula
See above
Put plants in trash; do not compost or leave on the ground in the dunes; seeds may ripen on stalks weeks after pulling
Leaves grasses alone; will kill other dicots
See above
Kills all vegetation. Note that no shoots should be allowed to sprout; dry and shred, or send to landfill

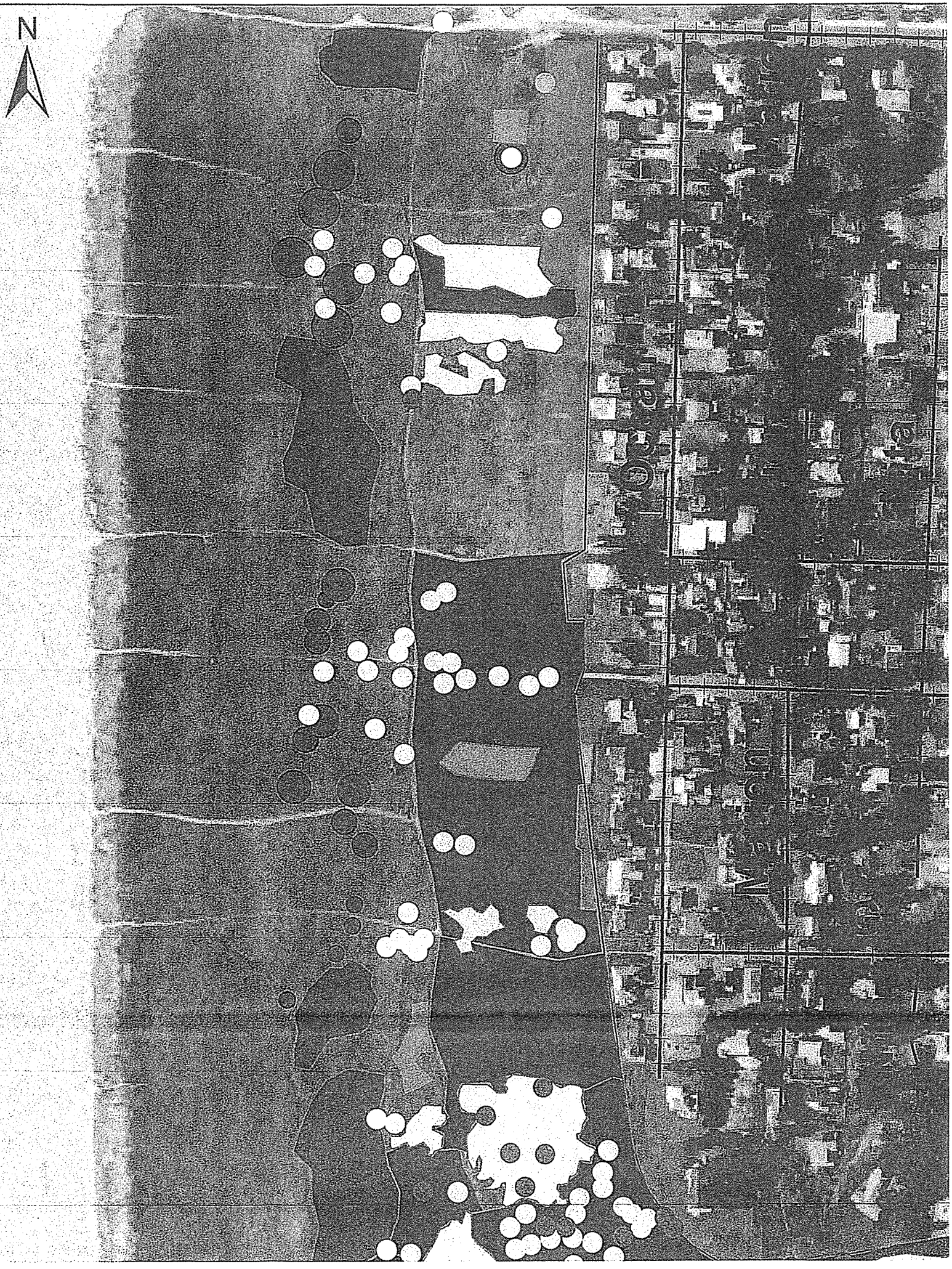

Kills all vegetation

Total	Mapped Areas	Management
20.83 acres	**Trees** (Includes Pine, Spruce, Alder and non-native tree species)	Cut and stump removal
129 Units	**Individual Trees** (not in a large grouped area; average of two trees per single unit)	Cut and stump removal
1.68 acres	**Trees+Large Scotch Broom Areas**	Cut and stump removal/mowing
32.40 acres	**Scotch Broom Management Areas**	Heavy mowing twice a year (fall and spring) with spot spraying regrowth in summer
1.48 acres	**Scotch Broom Management Areas Lite**	Mowing/spraying/hand cutting. Not as many plants as other areas
0.9 acres	**Scotch Broom Hillslope Area**	Includes hillslope along little beach dune. Hand cutting/spraying only
9.81 acres	**Native Conservation Areas** (Includes high density of native dune and prairie vegetation)	Mowing/spraying around edges and to keep non-native and invasives species out of the area.
8.85 acres	**Large Blackberry Patches**	Includes large patches with greater than and less than 50% cover. Mowing and spot spraying
3.39 acres	**Individual small Blackberry Patches**	Patches ranging from 5ftX 5ft to 200ftX200ft in size. Hand cutting/mowing/spot spraying
56 individuals	**Crabapple** (*Malus fusca*)	Leave
35 individuals	**Twinberry** (*Lonicera involucrata*)	Leave
0.05 Acres	**Japanese Knotweed** (*Fallopia japonica*)	Summer Spraying
7.77 acres	**100 ft Fire Buffer South of Pacific Ave. to Little Beach access trail**	Taken from edge of property line or 150 ft from S. Ocean Ave. Mow/maintain for fire safety
4.72 acres	**100 ft Fire Buffer North of Pacific Ave.**	Taken from edge of property line. Mow/maintain for fire safety

All the above mapped areas were mapped from Little Beach Access on Wellington Street southwest to the tip of the dune grass and north to end of 7th St. Areas were mapped using a Garmin 62stc and Esri ArcGIS 10.3 software. This is should not be considered an approved survey by the state of Oregon.

Calculations are based on both aerial survey and on the ground mapping and should not be considered final.

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Gearhart Foredune Woody Vegetation

Ecological and Management Options Matrix

Gearhart Ecological and Management Options Matrix	No Action: Woody species dominate	Partial Clearing: Some woody species remain in clusters	Maintain Grassland, no woody species
Large Animals	high usage	high usage	high-moderate usage
Small Animals	moderate to high usage	high usage	moderate usage
Birds	moderate usage	high usage	moderate usage
ESA-listed Species	NA [young forest]	NA	low
ESA-listed Species	low [old forest, > 100 yrs old]	low [old woodland conditions]	low
Plant Diversity	low [forest conversion]	moderate	moderate to high [with use of native dune species]
Noxious Plants	high [more woody species may enter when forest is well established]	moderate	low
Wetlands	NA	NA	NA
Human-Animal Hazardous Interactions	high [good cover for many animals]	high to moderate [some cover]	low [no cover]
Human-Human Hazardous Interactions	high [good cover]	high to moderate [some cover]	low [no cover]
Adjacent Resident Hazards	high [good cover]	high [some cover]	low [no cover]
Woody fuel for fire	highest woody fuel level	high to moderate fuel level	low woody fuel level [maintain mown strip each summer]
Potential for fire to move into residential areas	Highest	high to moderate	moderate to low [maintain mown strip each summer]
Ocean views	Low to no viewscape potential	Low to some viewscape	Highest viewscape potential

Gearhart Foredune Woody Vegetation Management

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Shoalwater Botanical
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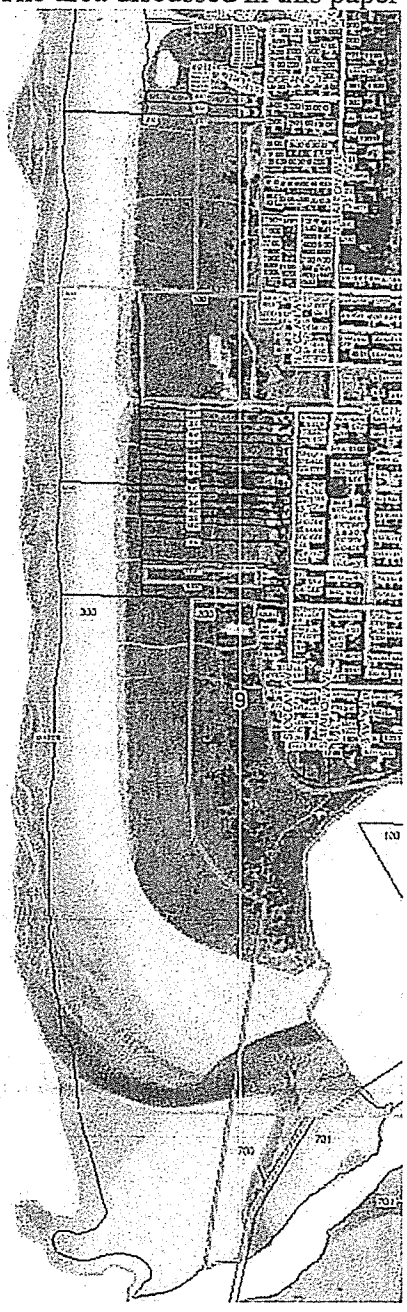
August 20, 2016

Gearhart Foredune Vegetation Management

Purpose

The purpose of this paper is to provide the City of Gearhart and residents with an understanding of dune ecology and vegetation management options for the foredune, west of the residential area, with three management options, a no action option, a woodland option (leaving some woody vegetation), and a grassland option (mowing all woody vegetation).

The area discussed in this paper is bordered by 7th Avenue on the north end, the Necanium Estuary on the south, residences on the east side, and the Dune Hazard line on the west side. See map for reference, showing City of Gearhart property overlays in green, on aerial of foredune, 2014.



Introduction

Dunes in Gearhart, Oregon have undergone rapid changes in the past two hundred years, transforming from diverse prairies to grass monocultures. Today, the dunes are grasslands. Remnants of the historic, diverse dune prairie live in small patches, well back from the present foredune near the west line of buildings.

At the same time, land management practices changed from small, fairly regular fires to largely suppressed fire. This allowed both native and introduced woody species to rapidly colonize soils behind the outermost dune.

Sediment management at the Columbia River Entrance also changed, and altered the sand accretion rate from several millimeters per year to many feet per year. In the 1950s there were no dunes west of the west line of residences. Accretion of sand formed a series of dunes westward. European beachgrass (*Ammophila arenaria*) and other plants moved naturally into these new dunes.

This presents several management situations for the City of Gearhart.

- First, the volume of wood that can fuel wildfires has increased significantly as shore pine, Sitka spruce, Scots broom and other woody species spread.

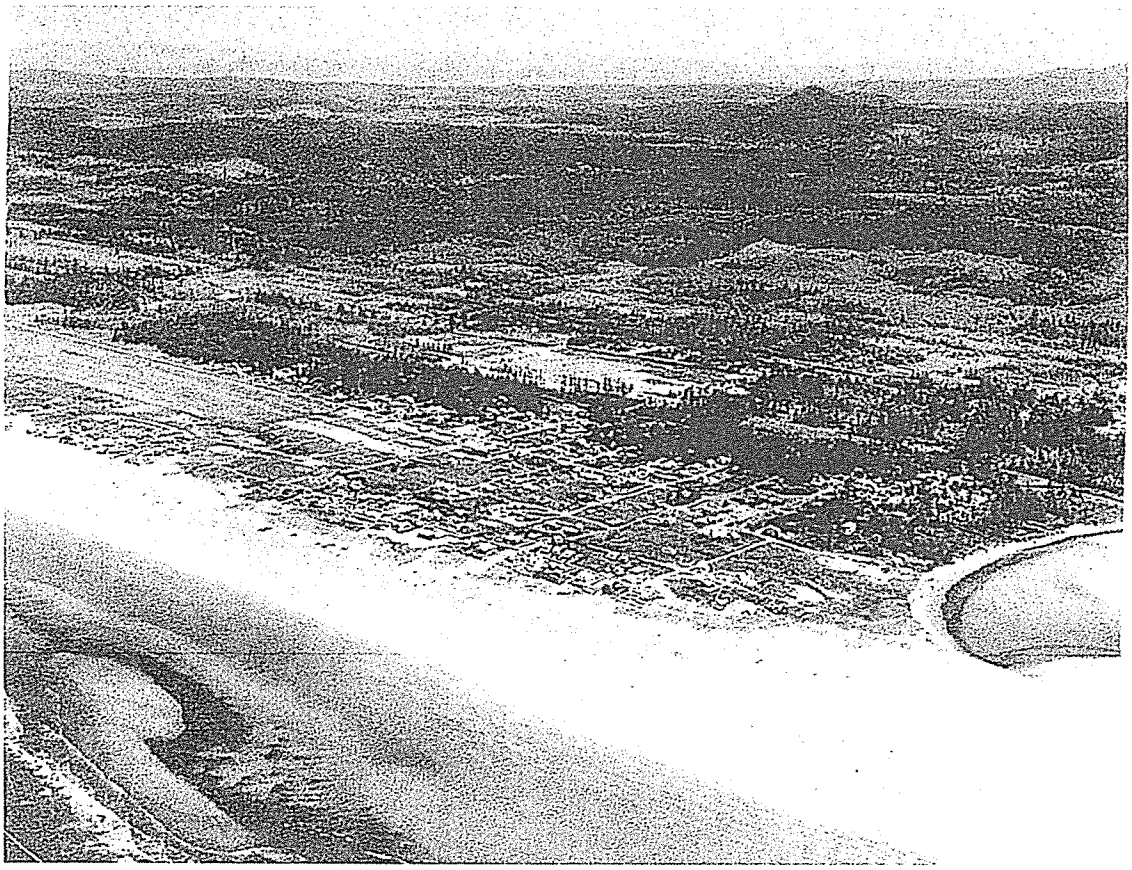
- Second, some plant species are state-listed noxious species that should be controlled.
- Third, food resources and cover have been created for many animals, including Roosevelt Elk and Black-tailed Deer, so that these species live immediately adjacent to and in the urban residential areas. Interactions with these species have increased.
- Fourth, the young coastal forests present increased opportunities for human-human and human-wildlife interaction hazards. Public safety has declined.
- Fifth, for coastal residents, visitors and others in the City of Gearhart, ocean views are vanishing into the new coastal forest.

The following matrix compares ecological values and Gearhart community values for three management options.

Gearhart Ecological and Management Options Matrix	**No Action: Woody species dominate**	**Partial Clearing: Some woody species remain in clusters**	**Maintain Grassland, no woody species**
Large Animals	High usage	High usage	High to moderate usage
Small Animals	Moderate to high usage	High usage	Moderate usage
Birds	Moderate usage	High usage	Moderate usage
ESA-listed Species	NA [young forest]	NA	Low, unless prairie is created in grassland areas
ESA-listed Species	Low [old forest, > 100 yrs old]	Low [old woodland conditions]	Low, and see comment above
Plant Diversity	Low [forest conversion]	Moderate	Moderate to high; highest if coastal dune prairie species are used
Noxious Plants	High	Moderate to high	Low
Wetlands	NA	NA	NA
Human-Animal Hazardous Interactions	High [cover for many animals]	High to moderate [some cover]	Low [no cover]
Human-Human Hazardous Interactions	High	High to moderate [some cover]	Low [no cover]
Adjacent Resident Hazards	High	High [some cover]	Low [no cover]
Woody fuel for fire	Highest woody fuel level	High to moderate fuel level	Low woody fuel level [also maintain mown strip each summer]
Potential for fire to move into residential areas	Highest	High to moderate	Moderate to low [maintain mown strip each summer]
Ocean views	Low to no viewscape potential	Low to some viewscape	Highest viewscape potential

Past Conditions

Historically, the dunes in Gearhart were a fire-maintained landscape. In this climate, except on very wet or very thin dry soils, prairie and grassland plant communities naturally advance to forest. Fire is the key disturbance to this process that resets plant communities to prairie or grassland conditions.



Aerial of City of Gearhart, 1950, shows small area of foredune west of city, and wide summer beach to west, composed of open sand. A small remnant prairie composes the vegetation west of the city in 1950, with forest on the east side of town.

This region is part of the Coastal Temperate Rainforest Biome, a conifer-tree-growing region that grows trees more rapidly than most of North America, and stores more carbon in the soil, on the surface and in standing living and dead trees, than all other forest types in the world. It is also part of the largest, most diverse belt of conifers in the world, extending from Mexico to Alaska. Left to grow without disturbance (wind throw, logging, fire), conifer trees flourish here.

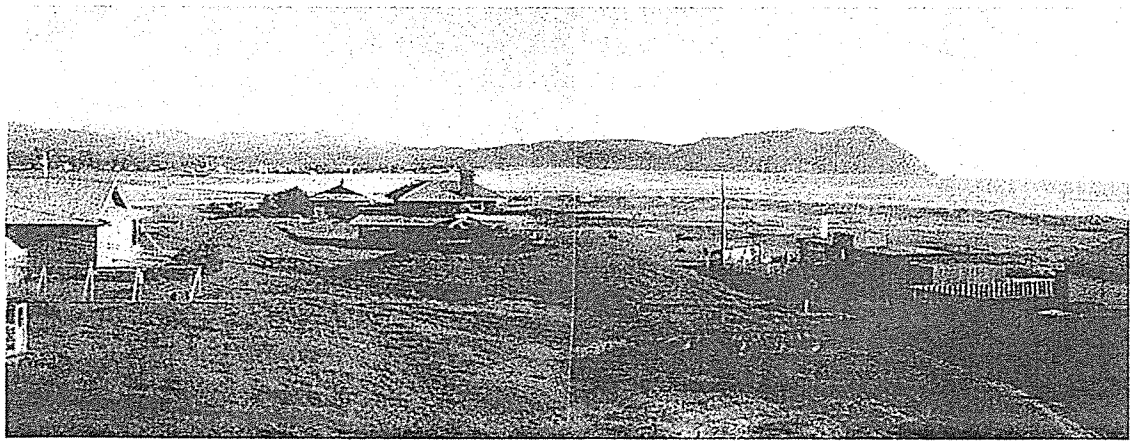
The Clatsop Tribe lived on the Plains for thousands of years, and had summer villages in several locations, typically close to freshwater streams. Keeping the Plains in prairie vegetation kept elk and deer close to the villages, and also promoted useful plant species

for food, fiber and medicine that prefer prairie conditions. Fire was their management tool. Occasional wildfires in the forests also occurred, probably started by lightning during dry seasons. The result was a patchwork of old growth and young forests in the hills, and coastal dune prairie along the ocean beaches.

Early 19th century explorers noted extensive "undulant grasslands" backed by dense forests in the hills to the east, and extolled the virtues of the Clatsop Plains for agriculture in letters, journals, reports and books, including members of the Lewis & Clark Expedition, James Dana of the Wilkes Expedition, and James Graham Cooper, naturalist and physician with the Northern Pacific Railway Survey. Cooper was the first early visitor to see the coastal dunes in May and June, when in full flower, and he wrote about it in glowing terms.

The outermost dunes supported wildflowers, sedges and grasses, growing in a luxuriant mixture. In late spring to early summer, this area was covered with wildflowers. A few hundred yards east of the beach, other grasses formed a denser meadow, growing with taller wildflowers over several dune ridges. This mix of grasses and wildflowers continued to the forest edge. Late 19th and early 20th century botanical explorers, including Lewis Henderson, T.J. Howell, Morton Peck and others wrote about this diversity and collected plants in the historic dune prairies along the North Coast.

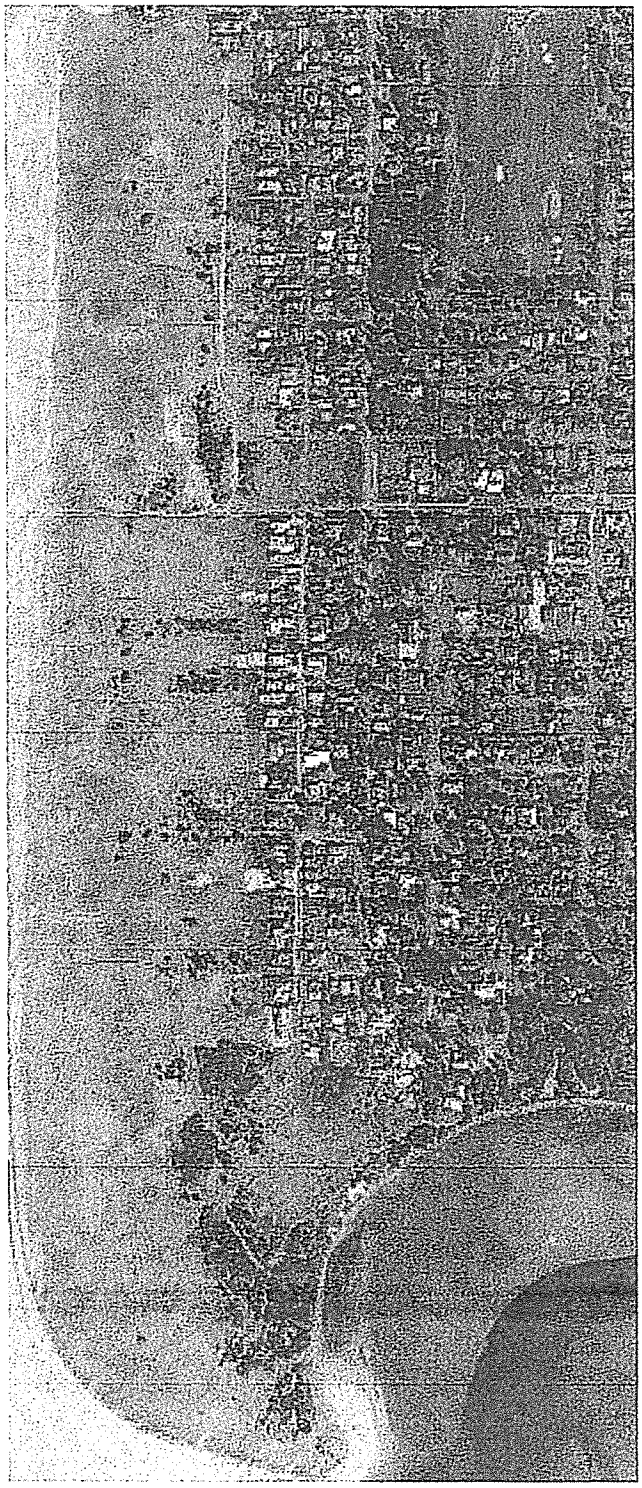
Prior to jetty construction at the Columbia River Entrance early in the 20th century, sand accretion on ocean beaches was measured in millimeters per year. Afterwards, it was and is measured in tens of feet per year, occasionally alternating with periods of erosion, or retrograde movement of the beach face east into the dunes. This situation will persist so long as sediment management continues for the shipping channel in the river, and the jetties remain intact. The foredune west of the City of Gearhart will to continue to build west as long as near-shore sand from the Columbia River is available in the surf zone.



September 1971, looking southwest towards Tillamook Head, foredune area is now grassland with a few small pines. West edge of city is still unforested.

Present Conditions

Fire suppression is now the normal condition for the foredunes. This means that woody species, including shore pine (*Pinus contorta* var. *contorta)*, Sitka spruce (*Picea sitchensis)*, and introduced shrubs such as Scots broom (*Cytisus scoparius)*, evergreen blackberry (*Rubus armeniacus)*, and many native shrubs, thrive between homes and ocean beach. See Appendix One for a plant list for the present foredune area.



This image, left, shows the present foredune and city. Dark green areas are trees in foredunes and in the city. The canopy linkage between these areas is increasing. Reducing woody fuel is now important. Areas that are light green-beige from the westernmost line of homes to the beach are locations where trees have already been removed.

Broom patches do not show in this image, but reducing this shrub is particularly problematic for fire management, because it is nearly as combustible as gorse (*Ulex europeaus)*, and grows in dense stands, shading out many other species and providing, in the case of wildfire, a fuel link between grasslands, homes and forest areas.

Rapid accretion of sand has continued to this day, and provides European beachgrass with ideal conditions to continue to dominate the western foredune.

As the vegetation line moves west, older soils to the east mature enough to support woody species, including shore pine, Sitka spruce, black twinberry (*Lonicera involucrata*),

Pacific wax myrtle (*Myrica californica*), evergreen huckleberry (*Vaccinium ovatum*) and red alder (*Alnus rubra*). These species form the first, young coastal forest in the dunes. This forest is wind, salt and drought tolerant. It is also capable of regenerating after fire.

With increasing cover by woody vegetation comes an important public safety issue: Predators and people can hide more easily in dense cover than in open grasslands. Perception of safety in public areas varies with age and sex, and is a subconscious decision that we all make all the time when in public spaces. The most important test of safety for a community is to know where women with young children do and do not feel safe. They will not enter an unsafe area, unless there is no other option. Elders with diminished physical capacity have a similar reaction. This standard is used by planners world wide to design and improve public areas for their communities.

Options For Foredune Management–

No Action—Management Notes

The foredune near the western edge of the city is a patchwork of Scots broom, blackberry thickets, and young coastal forest, with some areas of mixed grasses among these patches. It is transitioning from woodland (mostly open land between patches of trees) to forest (densely covered with trees, with little to no open land).

There are animals that thrive in dense forests, but many species prefer a more open, woodland condition. At this time, the transitional woodlands are optimal for elk, deer and other large animal species.

The greatest impacts for city residents are increased wildlife interactions, increased fire hazard, and impaired public safety, followed by loss of ocean views. Animal-human interactions are becoming more frequent as people, in yards and in the dunes, encounter wildlife in the densely vegetated areas. Negative human-human interactions are also more likely as cover increases in the wooded areas.

Uncontrolled fires are a significant safety hazard. During my site visits over the past few years, it is apparent that many residents have taken some steps to reduce wood fuel near residences, but this is not consistently applied across the dune landscape. See the last figure on page 6, which shows clearly which areas have been kept clear of woody species and which have not. The young forest is dark green, and patches of dark green show up throughout the foredune near residences.

At the least, a fire safety buffer should be implemented between western residences and wooded areas, where all woody species are removed. See the third option, Maintain Grassland, page 9 below, for specifics on fire safety buffers.

Partial Clearing—Woody Vegetation Management Notes

There are several ways to manage woody vegetation. A key reason to undertake woody species management is to improve fire safety and public safety. No woody vegetation

should grow within fifty feet of structures. Beyond this perimeter, trees should be limbed to reduce the ability of a grass fire to move into a tree canopy, and trees should be thinned, to reduce the ability of a canopy fire to move from tree to tree. There should be a canopy break between foredune forests and urban trees in the city, so that fires cannot easily spread into the city.

The foredune area provides habitat for many animals. Management activities in fall and winter generally reduce disturbance to animals.

The approach to management depends on the community's needs. For the partial clearing option:
Reduce fuel loads by thinning trees so that their canopies do not touch, cutting at ground level, then limbing up a minimum of six to eight feet. This method creates and maintains a woodland of widely spaced trees, instead of clusters of very dense forest. Limbing opens up the trees, spatially separating the canopies from the grassland. It creates a landscape where people feel safe: they can see easily through the trees, and the trees are widely spaced. Fires that start in the grass may reach some tree canopies, but with well-spaced trees, fires cannot spread easily from tree to tree.

If all woody vegetation is to be removed:
1. Remove tall woody species throughout the site by cutting down trees, removing logs more than 8 inches in diameter, chipping logs and branches under 8 inches in diameter, and grinding stumps. Bringing in any equipment from other sites carries the risk of introducing new weedy species if equipment is not properly cleaned between sites. See Equipment and Vectoring in of new species, below, and the brochure about cleaning vehicles and equipment.

2. Downed wood can be chipped on site, or removed. Chip layers should not exceed six inches in depth when initially spread, and no logs should be left on site. The cleared forest area should be well separated from the residential area: A minimum of two hundred feet is probably a safe distance. Chipping is best done with a chipper on site to reduce traffic in the foredune. There are already trees with diameters of more than twelve inches in the foredune [circumference of 38 inches or more at 4.5 ft from the ground, or DBH—diameter at breast height].

3. Fire is an alternative to reduce the volume of wood to chip. Use controlled burning to reduce standing wood, then clear out the dead wood afterward. This may reduce the standing volume of woody debris by half or more, and if hot enough, will almost completely remove small trees. The same cautions about clean equipment and vehicles apply. In addition, if partially burned wood is handled, workers must protect their lungs from fine soot particles and sooty dust. However, this brings smoke hazards to local residents and anyone downwind of the fire.

4. Where trees are young, under four feet tall, they can be mown with a tractor based flail mower ("brush-hog") or clipped at ground level. Mowing is particularly useful if young trees are mixed with Scots broom, as both can be mown at the same time.

5. Stump grinding will ensure that future mowing can be done safely in the formerly timbered areas. As with other equipment, it's important that each grinder be cleaned before coming to this site to reduce introduction of new noxious species.

6. Isolated low shrubs of native plant species may be retained in the foredune for bird and small mammal habitat.

Maintain Grassland Option—Management Notes

Dry season fires are an all too common hazard for dune residents. Important guidelines for improving fire safety are to remove all woody plants within fifty feet of structures, creating a fire safety zone, and to mow that fire safety zone each year at the start of the dry season.

This reduces available fuel for fires moving east from open land to buildings, and improves the odds that fire protection teams can arrive in time to keep structures from burning. Mowing a summer fire-safety buffer—fifty feet from structures to grasslands—should be done as the dry season starts and grasses slow their growth.

Outside the fire safety buffer, mow regularly to reduce Scots broom and other woody species. Timing for this mowing is important. Ground-nesting birds and mammals have active nests and young during spring and summer. This area should be mown only in fall or winter—October to early March.

. There are two approaches:

1. Mow all of the foredune grassland areas once every three years. The areas to mow are where Scots broom, or other woody species grow, including shore pine. Leave the foredune alone for two years; then mow again. There is no need to mow areas that have only wildflowers and grasses.
2. Mow one third of this foredune grassland area every year, leaving two thirds alone each year. As with #1, mow only those areas with woody species.

Both approaches allow perennial wildflowers to grow and flower in the grassland, and give resident birds and animals refuge areas in two out of three years during spring and summer. The areas to mow are those with numerous tree seedlings, blackberry thickets and Scots broom patches. There may be other areas (including those with Canada and bull thistle) that should also be mown regularly to make other control methods more effective. Work with Clatsop Soil and Water Conservation District on optimal control methods for these species, patch by patch.

Noxious and Problematic Plants

Several state-listed noxious species, and problematic plant species are already present in the foredune area. Noxious woody species include Japanese knotweed, Scots broom and others. Herbaceous species include tansy ragwort, Canada thistle, bull thistle, and

blackberries. Most species are best mown or cut down in winter, and treated with herbicides in summer. Work with Clatsop Soil and Water Conservation District on optimal control methods for this site.

Knotweeds are capable of completely excluding native species, including trees, and form dense thickets that spread outward in all directions each year. Gearhart should work with the conservation district to remove this species from the foredune, and monitor this area to keep it from returning.

Scots broom grows in dense thickets, shading out most plants. A typical broom thicket has mosses and a few grasses growing on the ground. It is a fire hazard. Broom seeds live fifty to seventy years, so keeping this woody shrub down is a long-term project. Seeds are explosively thrown from pods in mid to late summer, carried off and cached by mice and voles in underground stores, and also in buildings. Minimizing disturbance to the upper soil layer helps reduce seed germination once the mature shrubs are gone.

Tansy ragwort (*Jacobaea vulgare*) is toxic to livestock and wild grazing species, including deer and elk. There are insect biological controls being used in Oregon, but these are not always effective along the immediate coast. In the foredune area, the most effective control method is to pull plants when in flower and before seed set, and dispose of them in municipal waste. They should not be composted. Drying stalks with ripening ovaries can still mature seeds. Like other daisies, ragwort seeds have plumes that loft in the air to disperse them.

Canada thistle (*Cirsium arvense*) and bull thistle (*Cirsium vulgare*) are stout perennial thistles that grow in dense thickets, and like ragwort, have plumed seeds spread through the air. Native species that grow in the dunes are edible or Indian thistle (*Cirsium edule*) and short-styled thistle (*Cirsium brevistylum*). The latter two species grow as single stems or very small clumps, and are not management problems, and all species are easily identified when flowering. The native thistles should be left to live in the dunes. Canada thistle and bull thistle will become more and more dominant if not removed. Work with the local conservation district to find effective control methods for these species.

Atlantic ivy (*Hedera hibernica*), the larger-leaved cousin to English ivy (*Hedera helix*), is a pest of woodlands adjacent to urban areas. Ivy vines circle tree trunks, slowly killing trees through girdling. Mature vines occupy the upper tree canopy, shading the tree's leaves, and flowering. Fruits are edible to birds, which spread seeds widely. Forest Park, Portland, has a No Ivy League that has been clearing canopies and digging out roots for many years. Ivy is salt tolerant, and grows on seacliffs, shrubs and trees along the dunes in many places on the Pacific Northwest coast. I did not see ivy during visits to the Gearhart foredunes, but it is important to keep watch for it, and remove it when it appears.

Introduced blackberries in the dunes include Himalayan blackberry (*Rubus armeniacus)* and cut-leaf blackberry (*Rubus laciniatus*). Both grow in dense thickets of arching vines, heavily armed with spines, and produce edible berries that birds, deer, coyotes and other

animals eat. Seeds live a few years in the soil, so these species may reappear years after parent plants were removed. Mowing followed by herbicides on sprouting crowns is an effective control method. Past years' woody vines may take several years to decompose, so thickets can be important fire fuel locations. Many small animals use thickets for cover, and elk and deer browse the young leaves. Birds use the thickets in winter for shelter. Himalayan blackberry is a listed noxious species.

Problematic Species (not yet listed as noxious by the state):

1. Cotoneasters (*Cotoneaster* sp.) are a large genus of ornamental woody shrubs with small showy flowers and edible fruits. Birds eat the fruits and spread the seeds. Several species have naturalized in this area, and some look very like evergreen huckleberry when not in flower. They can grow into dense thickets, and like Scots broom, will exclude other plant species. No cotoneasters have achieved noxious weed status in Oregon yet, though several species are approaching a formal listing. Hand pulling small plants, and use of herbicides on stumps and larger plants is effective. Seeds may live a few years in the soil, so complete removal may take some time. There are several patches of cotoneaster in the foredunes.

2. English holly (*Ilex aquilifolium*) is an evergreen tree with fruits that birds eat and disperse. The leaves have sharp spines; leaves on young plants have more spines than on older plants. Holly stumps re-sprout when cut down, so herbicides or stump pulling are used to remove them. There are several holly trees in the foredunes.

3. Cherry Laurel (*Prunus lauroceras*) is an evergreen tree with fruits that birds eat and disperse. Deer and elk browse the leaves. Trees grow forty feet wide and high. This species is a popular hedge material due to its fast growth, but because it has edible fruits, it spreads easily into open areas, where it quickly forms dense clumps. I removed a seedling during my site visit in August 2016.

It is likely that other problematic species are now living in the foredune area, and should be included in long-term management of this area.

Improving Native Species Diversity

Removal of listed noxious plant species and regular mowing to reduce woody introduced shrubs will maintain the foredune as grassland. To promote other native prairie species, consider spreading seeds of flowering species already present in the foredune area, including yarrow (*Achillea millefolium*), pearly everlasting (*Anaphalis margaritacea*), and seaside tansy (*Tanacetum camphoratum*). See Appendix Three for a list of native species to consider for dune prairie planting.

The restoration of a low open highly diverse prairie community is a time consuming undertaking. First, the beachgrasses and other patch-forming introduced grasses will need to be removed. At this time, the recommendation is to control the woody species, and

promote tall, vigorous wildflowers that can compete with European beachgrass, mentioned above.

Timing of Control Methods to Protect Wildlife
Wildlife, including insects, mammals and birds that live in the foredune area, reproduce each spring and raise young during the summer. This means that control activities should take place outside this period, in fall and winter.

Equipment and Vectoring in of new Plant Species
See pamphlet from NOAA on cleaning vehicles.

Appendix One: Common Plant Species of the Gearhart Foredune

List complied from site visit, August 2016; this is not a complete species list for the foredune area.
Introduced species (*)

Grasses, rushes, sedges

Aira caryophyllea, silky hair grass (*)
Aira praecox, common hair grass (*)
Ammophila arenaria, European beachgrass (*)
Ammophila breviligulata, American beachgrass (*)
Anthoxanthum odoratum, sweet vernal grass (*)
Carex brevicaulis, short-stemmed sedge
Carex macrocephala, big-headed sedge
Carex obnupta, slough sedge
Carex pansa, sand-dune sedge
Dactylis glomerata, orchard grass (*)
Festuca rubra, red fescue
Holcus mollis, creeping velvet grass (*)
Juncus balticus, Baltic rush
Juncus falcatus, sickle-leaf rush
Juncus bufonius, toad rush
Juncus leseuerii, salt rush
Leymus mollis, American dune grass

Woody Plants (trees and shrubs)

Alnus rubra, red alder
Arctostaphylos uva-ursi, kinnikinnick
Crataegus monogyna, European hawthorn (*)
Cytisus scoparius, Scots broom (*)
Fallopia japonica, Japanese knotweed (*)
Hedera helix, English ivy (*)
Hedera hibernica, Atlantic ivy (*)
Ilex aquifolium, English holly (*)
Lonicera involucrata, black twinberry
Malus fusca, Pacific crabapple
Malus x domestica, apple (*)
Myrica californica, Pacific wax myrtle
Picea sitchensis, Sitka spruce
Prunus lauroceras, cherry laurel (*)
Pinus contorta var. contorta, shore pine
Rubus armeniacus, Himalayan blackberry (*)
Rubus lacninatus, cut-leaf blackberry (*)
Rubus spectabilis, salmonberry
Rubus ursinus, Pacific blackberry
Sambucus racemosa, red elderberry

Thuja plicata, western red cedar
Vaccinium ovatum, evergreen huckleberry

Perennials (herbaceous, including wildflowers)
Abronia latifolia, yellow sand-verbena
Achillea millefolium, yarrow
Anaphalis margaritacea, pearly everlasting
Armeria maritima, sea thrift
Cardionema ramosissima, sand bur
Fragaria chiloensis, beach strawberry
Hypochaeris radicata, hairy cat's-ear (*)
Lathyrus japonicus, beach pea
Lupinus littoralis, beach lupine
Maianthemum dilatatum, Pacific lily of the valley [woodland-forest species]
Polygonum paronychia, black knotweed
Solidago canadensis, Canada goldenrod
Solidago simplex var. spathulata, coast goldenrod
Sonchus species, sow-thistle (*)
Spiranthes romanzoffiana, ladies twisted stalk
Symphyroicarpos subspicatus, Douglas aster
Tanacetum camphoratum, dune tansy
Vicia gigantea, giant vetch

Appendix Two: Noxious and Nuisance plants of the Gearhart Foredune

Contact Clatsop Soil and Water District about control methods; some may require herbicides in addition to or instead of mowing. This is a preliminary list. Other noxious plant species may be present in the foredune area.

Noxious Plants

Cirsium arvense, Canada thistle
Cirsium vulgare, bull thistle
Cytisus scoparius, Scots broom
Fallopia japonica, Japanese knotweed
Hedera hibernica, Atlantic ivy
Jacobaea vulgare, tansy ragwort [formerly Senecio jacobaea]
Rubus armeniacus, Himalayan blackberry
Rubus lacninatus, cut-leaf blackberry is not listed as a noxious weed, but has the same behavior as R. armeniacus

Nuisance Plants

Cotoneaster species
Ilex aquifolium, English holly
Prunus lauroceras, cherry laurel

Appendix Three: Perennials native to coastal dune prairie, Gearhart and Clatsop Plains

Use this list as a reference for planting to increase diversity of herbaceous species. √ indicates species is present in Gearhart foredune area.

Grasses, rushes and sedges
Agrostis exarata, spike bentgrass
Agrostis scabra, rough bentgrass
Calamagrostis nutkensis, Pacific reedgrass
Carex brevicaulis, short-stemmed sedge √
Carex pansa, sand-dune sedge √
Danthonia californica, California oatgrass
Festuca rubra, red fescue √
Leymus mollis, American dunegrass √
Poa confinis, dune bluegrass
Poa macrantha, seashore bluegrass

Perennials
Achillea millefolium, yarrow √
Allium cernuum, nodding onion
Anaphalis margaritacea, pearly everlasting √
Angelica hendersonii, sea-coast angelica
Agoseris apargioides, seaside agoseris
Armeria maritima, sea thrift
Artemisia campestris, silky field wormwood
Artemisia suksdorfii, coast wormwood
Aster chilensis, California aster
Cardionema ramosissima, sand-bur √
Castilleja affinis,
Cerastium arvense, field chickweed
Cirsium brevistylum, short-styled thistle
Cirsium edule, edible thistle
Erigeron glaucus, beach fleabane, or beach daisy
Fragaria chiloensis, beach strawberry √
Fritillaria affinis, chocolate lily
Lathyrus japonica, beach pea √
Lotus formosissimus, seaside birds-foot trefoil
Piperia elegans, coast piperia
Polygonum paronychia, black knotweed √
Ranunculus occidentalis, western buttercup
Solidago canadensis, Canada goldenrod √
Solidago simplex var. spathulata, coast goldenrod √
Spiranthes romanzoffiana, hooded lady's-tresses √
Tanacetum camphoratum, dune tansy √
Trifolium wormskjoldii, coast or springbank clover
Triteleia coronaria, harvest brodiaea
Triteleia hyacinthina, white brodiaea
Vicia americana, American vetch
Vicia gigantea, giant vetch √

Kathleen Sayce
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EDUCATION:

Graduate studies (Botany) Arizona State University, Tempe AZ, 1979-1980.

Master of Science (Botany) Washington State University, Pullman WA, 1978.

Bachelor of Science (Biology) Fairhaven College at Western Washington University, Bellingham WA.1975.

WORK:

1987– current, principal, Shoalwater Botanical, doing ecological services, including wetland delineations, species assessments, habitat assessments and ecological surveys.

1998 – 2010: Assistant Vice President, Science Officer, ShoreBank Pacific, Ilwaco Washington. Major focus: develop mission assessment process, using The Natural Step as the basis, applied to business clients. Worked with clients to improve process, operate businesses more efficiently. Other tasks: public speaking, writing for bank. Consulting work: Wetland delineations, mitigation plans, mitigation monitoring, ecological assessments, more than 50 clients in 10 years.

1996 -1998 – Science Director, Willapa Alliance, South Bend WA. Produced Willapa Indicators for Sustainable Community, chaired Willapa Science Group and organized annual local science conference, maintained biotic inventory, and developed science related programs for the Alliance, including library, GIS, and monitoring programs.

1995-6 – Wetland Educators Institute, Seaside, OR. Botanical instructor for week-long program; trained teachers in wetlands science methods and to focus on goals instead of curriculum in developing programs. Funded by USFWS; organizer, Neal Maine, North Coast Land Conservancy, Seaside, Oregon.

1996-1997 – Instructor, Clatsop Community College. Taught stewardship class, continuing education.

1993 - 1995 – Project Coordinator, Willapa Watershed Volunteers, WSU Cooperative Extension stewardship group. Pacific County, WA. Responsibilities: Scheduled, coordinated and taught classes, organized ongoing field trips and coordinated volunteer activities.

1993-1995 – Toxic phytoplankton monitoring, Washington Department of Health, Shellfish Program. Multiple sampling sites on Willapa Bay and ocean beaches. Funding US FDA.

1992-93 – Fellowship, Ecotrust, Portland, OR. Phytoplankton of Willapa Bay. Organized network of samplers for Willapa Bay and Columbia River, ongoing maintenance of database was part time in 1994-5, partially supported by Washington Department of Health during 1993-1995 to continue data set. Determined that bloom origination for several dinoflagellate and diatom species was not in nearshore coastal environments, which led eventually to the discovery of offshore origination in gyres around Cobb Seamount by NOAA team.

1990-1992 – Ecological field work, including flight period surveys for Oregon silverspot butterfly on Long Beach Peninsula; sites covering six miles of old coastal dune prairie; Washington Department of Fisheries and Wildlife. As part of this work, 12 acres of prairie was acquired for habitat restoration.

1991-1996 – Contractor, mitigation plan for Airport Improvement Project, City of Westport, WA. Worked with Lou Messmer, designed and implemented mitigation plan for the city's airstrip expansion program.

1988-92 – Library Associate, Timberland Regional Library. Managed Ilwaco and Ocean Park branches of TRL system. Supervised five staff and twelve volunteers, represented library to Ilwaco city library advisory board and Peninsula Friends of Library board.

1987-88 – Contractor, Willapa National Wildlife Refuge, Ilwaco WA. Ecological study of smooth cordgras, *Spartina alterniflora* in Willapa Bay. Digital copy of report available on Friends of Willapa NWR website. This was the first paper on impacts of spartina on estuaries in the Pacific Northwest.

1975 – Field worker, USFWS, Willapa National Wildlife Refuge, Ilwaco, WA. Timber-cruised Long Island stands, timberland-for-land-and-private-timberland trade between USFWS and Weyerhaeuser Co. Long Island was eventually purchased by USFWS; the western red cedar grove that triggered the original logging controversy in 1972, and which drove this acquisition, remains the largest lowland/coastal old-growth cedar stand in the Pacific Northwest.

COMMUNITY PARTICIPATION:

2014 – Ongoing: President, Filipendula Chapter of Native Plant Society of Oregon, on the north coast of Oreogn and south coast of Washington, including Pacific, Clatsop and Tillamook Counties.

2012 – Ongoing: President of Board, South Pacific County Community Foundation. Mission: To improve the quality of life in south Pacific County.

2002 – 2014: Board member, Confluence Project. Member for south Pacific County. Built 5 public art installations by 2010, designed by Maya Lin, as part of the bicentennial activities for the Lewis & Clark Expedition. Locations are along the Snake and Columbia Rivers. Local site is at Cape Disappointment.

2001 – 2004 Board member, Lower Columbia River Estuary Partnership. Financial sector member; LCREP works to unify both states and local communities to improve water and habitat quality along the Columbia River west of Bonneville Dam.

1984-ongoing: Volunteer, Willapa National Wildlife Refuge.

1990-ongoing: volunteer weed identification for WSU-Long Beach Coastal Research Station, Long Beach, WA.

1987-ongoing: Vascular plants of Columbia Coast, site lists and background information posted at: http://users.reachone.com/columbiacoastplants/

PUBLICATIONS & WEB POSTINGS (Partial List):

2015 Sayce, Kathleen and Roche, Cindy. Plant of the year: Sea Bluff Bluegrass (*Poa unilateralis*), in Kalmiopsis 21, pp 32-38.

2012 – current, Natural History Column, Chinook Observer, Long Beach WA, and reposted on blog, Columbia Coast Natural History.

2010 Sayce, Kathleen. "Oregon Plants, Oregon Places: Botanizing in the Swala-lahos Floristic Area," Kalmiopsis, Vol 17, pp 17-28.
"Legacy Bulbs," Pacific Bulb Society, http://www.pacificbulbsociety.org/pbswiki/index.php/LegacyBulbs Discusses bulbs that outlive their original gardeners in temperate to subtropical climates around the world.

2007 Brennan, Kirsten and Sayce, Kathleen. "Noteworthy Collections–Washington: *Abronia umbellata* at Leadbetter Point, Pacific County, Washington." Madrono Vol. , pp.

2005. Civlle, J.C., Sayce, K., Smith, S.D. & Strong, D.R. "Reconstructing a century of *Spartina alterniflora* invasion with historical records and contemporary remote sensing." Ecoscience, Vol 12(3): 367-375.

2004. Sayce, Kathleen. "Columbia Coast Plants." URL: www.reachone.com/columbiacoastplants. Website was assembled by and is maintained by Bev Arnoldy; content is author's responsibility. Includes site lists for eight state and national parks, regional plant list, and essays on local plant habitats.

2002. Sayce, Kathleen. "The last straw." Beachcomber's Alert, Spring 2002. Edited by Curt Ebbesmeyer, Seattle, WA.

1998. Sayce, Kathleen, editor. Willapa Indicators for a Sustainable Community - 1998. Willapa Alliance, South Bend, WA.

1997. Sayce, Kathleen, Dumbauld, Brett, and Hidy, James. "Drift potential for *Spartina alterniflora* stems, spikes and leaves." Proceedings of second International Spartina Control Conference, March 1997, Olympia, WA.

1997. Sigleo, Anne & Sayce, Kathleen. Poster, "Nutrient Source Assessement for Willapa Bay, Washington." Annual Estuarine Research Society Conference, October 1997, Providence, Rhode Island.

1997. Text sections and slides on *Calamagrostis*, *Spartina alterniflora*, *S. anglica*, *S. patens* and *Phragmites communis* for Wetlands Plants of Western Washington, produced by Washington Native Plant Society, editor, Sarah Spear Cooke.

1996. "Local Science in Willapa Bay, Washington," a case study, in The Rain Forests of Home: Profile of a North American Bioregion. edited by Peter Schoonmaker, Bettina von Hagen and Edward C. Wolf. Island Press.

1996. Sigleo, Anne & Sayce, Kathleen. "Runoff, nutrient, and phytoplankton variations in Willapa Estuary, Washington." abstract for conference presentation, AGU ASLO 1996 Ocean Sciences Meeting, February 12-16, 1996, San Diego, California.

1996. Poster, "Dinoflagellate blooms in Willapa Bay, 1992-1996." World Aquaculture Conference, Seattle WA.

1996. Sayce, K. & Horner, R. "*Pseudo-nitzschia* spp. blooms in Willapa Bay, Washington, 1992-1993." International Symposium on Toxic Phytoplankton. Paper presented as poster session at conference in Japan, summer 1995 by Rita Horner, junior author.

1995. "Assessing the risks smooth cordgrass and its control pose to wildlife in Willapa Bay, Washington." Grue, Christian E, G.R. VanBlaricom, F. L. Paveglio, K.M.Kilbride, J.A. Hidy, J.C. Civille and K. Sayce. Paper presented at Wildlife Society Annual Conference, 1995 by C. Grue.

1995. "Phytoplankton of Willapa Bay, Washington, 1992-1994." Fellowship report to Ecotrust, Portland, OR, the Willapa Alliance, South Bend, WA, and The Nature Conservancy, Seattle, WA. Details two years of weekly phytoplankton species surveys and general water conditions, historical survey of related research.

1993. "Burrowing shrimp Integrated Pest Management Plan" finalized in committee. Revised draft available for public distribution, 1994.

1993. Spartina Management Plan for Willapa Bay, Washington. Draft prepared for WDA, used as starting draft for Pacific County's SMP, 1994.

1993. "Surface and vertical tows to determine zooplankton volumes in Willapa Bay, Washington, from winter to summer solstices, 1993." Report prepared for Willapa Alliance, South Bend, WA. 7 pages plus graphs.

1991. "Survey and management of Oregon silverspot butterfly habitat on Long Beach Peninsula, Washington." Washington Dept. Wildlife, 5 pp.

1991. "Species displaced by *Spartina* in the Pacific Northwest." pp. 26-27, in Spartina Workshop Record, Eds. T. Mumford, P. Peyton & J.Sayce. Spartina Workshop, November 14-15, 1990, Seattle, WA. Washington Sea Grant Program, College of Ocean and Fishery Science, University of Washington, Seattle, WA. 73 pp.

1990. "Evaluation and proposed management of Oregon silverspot butterfly habitat on Long Beach Peninsula, Washington." Washington Dept. Wildlife, 22 pp.

1988. Introduced cordgrass, *Spartina alterniflora* Loisel., in salt marshes and tidelands of Willapa Bay, Washington. USFWS contract # FWSI-87058 (TS). July 1988, 70 pp. Digital copy is posted on Friends of Willapa NWR, website, www.willapabay.org/~fwnwr, in spartina section, spartina studies

Clatsop Soil and Water Conservation District
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August 4th, 2016

Attn: Chad Sweet
City of Gearhart
698 Pacific Way
Gearhart, OR 97138

Re: Little Beach Dunes and Invasive Species Removal

Dear Mr. Sweet,

This letter is in support of addressing invasive species such as scotch broom and introduced shore pine along the Necanicum River estuary and the associated Gearhart dunes.

Clatsop SWCD has been treating noxious weeds throughout Clatsop County for many years. Our noxious weed control funding comes from the Oregon Weed Board and limited based on species; determined by the Oregon Department of Agriculture noxious weeds ranking system. We received funding for 2016-2017 to continue our efforts to control and monitor a specific list of species.

This unfortunately leaves us unable to address other noxious and invasive weed found throughout the county. Scotch Broom in particular has maintained a strong hold throughout our region, efforts to combat this species is only on a volunteer basis. Scotch broom directly affects the soil and water quality of our region by increasing nitrogen levels in low nutrient based soils. These low nutrient soils commonly found in our dune system and around the estuary maintain native vegetation that has adapted to the low nutrient substrate. When changing the soil chemistry through non-native influences such as nitrogen fixing plants (scotch broom), this allows for other non-natives to establish and take over. Therefore out competing native plants adapted to the native low nutrient soils.

Other non-native species such as the introduced shore pine and European beach grass also affect the plant life and ecology of the dune system. These introduced species can out compete other native plants, changing soil chemistry and structure along with the historic ecological functionality of the system.

Sincerely,

Austin Tomlinson
District Technician