

Gorse Control Tactics and Strategy for Jughandle State Reserve

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Note: Preliminary Draft

This is preliminary. I've presented information that is correct to the best of my knowledge, but in some cases I've presented information without expressing doubts where I'm not sure. I am depending upon others to correct my errors. The recommendations at the end are also tentative and made in order to elicit responses and opinions.

Purposes

The purposes of this document are:

1. to describe and discuss the results of various approaches to gorse control.
2. to make some preliminary suggestions about the design of a short-term gorse control program for Jughandle State Reserve.

Approaches to Gorse Control

A. Control of Established Stands of Gorse

1. Removing, Rooting, and Rototilling (the "3-R Method")

The "standard" first-stage in dealing with major, established stands of gorse in Jughandle and the surrounding areas of Caspar has three components:

- a) **Removing** -- large gorse plants are removed either by hand or machine, generally attempting to remove as much of the root as possible. The plants and roots are piled up and burned. Often the piling is done using a tractor or caterpillar and a lot of dirt gets included in the piles. The piles are then burned. Burning is often difficult because of the dirt and roots included. A great deal of noxious smoke is produced by burning.
- b) **Rooting** -- as many of the roots remaining after the Removal stage are removed. This can be done by hand on small plots, but generally mechanical equipment is use to push or pull through the dirt, snagging the roots. The roots are piled and burned.
- c) **Rototilling** -- the ground is rototilled to level out the disturbed earth and to chop up roots that have been missed in the first two stages.

3-R Follow-up Methods

After applying an initial 3-R treatment, there is generally a large germination of gorse seeds and significant, vigorous resprouts from roots sections that have been missed. If no follow-up control is done, the field will become solid gorse within five years. The Wong property at the southern edge of Jughandle was completely removed of gorse by the 3-R method in the early 1990's. It now is covered with gorse, sections of which are over 8' tall.

Different alternative follow-up control methods have been tried:

- a) **Mowing** – this is a method used by a number of residential landowners in Caspar (the Schooleys, Juhls, Desmonds, David Wong). Unless done several times a year, it is necessary to “mow” with a “bushhog,” or large, heavy-duty, tractor-mounted rotary mower. Mowing does not kill the gorse plants but keeps them low and under control. If done at the right time of year, mowing “shocks” the plants somewhat and retards their growth during the following season.

To prevent substantial flowering and seed production, mowing must be done at least annually. A previously rototilled and mowed area that is left unmowed for three years will generally become a solid gorse patch of 3’ –5’ plants.

- b) **Hand removal** – Several homeowners in Caspar have used hand removal of sprouts and seedlings (the Schooleys and Duffs). The Schooleys have been using this method since 1975 on the area immediately around their house. The Duffs have been using it for several years on their property. Hand removal is a very time-consuming and tedious method, especially in the first years after rototilling, when there are lots of sprouts. As with all control methods, annual effort is required. This method is effective at eliminating most gorse plants, although because gorse seeds last for 30 years, the danger of reinfestation exists if control is halted.
- c) **Rototilling** – State Parks and several local property owners (Schooleys and Stewart Tregoning) have used repeated rototilling for gorse control. The Schooleys used this method on a field from 1975 until about 1995. The first several years it was rototilled annually and used for potato growing. After that it was rototilled every two or three years. Parks has used rototilling for control in a number areas. One previously rototilled area near Gibney Lane was re-rototilled in 1994. No significant gorse grew there for five years. Discouragingly, however, a visit in December 1999 showed a high density of new sprouts throughout the treated area. Apparently, the seeds lay dormant in the ground for five years, until conditions for germination were especially favorable (perhaps due to the heavy rains of the preceding two winters). Thus, a number of years without the appearance of gorse is no sign that gorse has been eliminated.
- d) **Grazing** – Grazing is an effective means of keeping gorse from re-establishing in treated fields. The Caspar Cattle Company grazes cattle, which has kept most of its property relatively free of gorse, although not completely. John grazed llamas in his field and had good results. Several fields grazed with horses appear to have no mature gorse plants. In Scotland, where gorse is native, it is used as hedgerows on fields, and grazing sheep keep the gorse under control (although it is apparently not as vigorous as Caspar gorse). Goats are also reported to eat small gorse plants.

Grazing only works if mature plants have been removed first. Animals will eat seedlings but not mature plants. Fields must be fenced to contain the animals.

Grazing is not suitable for areas where there are tender plants that one desires to allow to grow.

- e) **Herbicides** – Parks and local residents have used herbicides (primarily Roundup, although Parks selected Garlon for a 1994 spray treatment because it is not toxic to grasses) as a follow-up control measure.

Local residents' experience is that herbicides are generally effective against seedlings; they will not immediately kill re-sprouts from roots, but will keep the plants from vigorous growth and eventually kill them. Yearly applications are required to prevent re-establishment of gorse patches.

Parks pesticide application included treating resprouts at the edge of edge of tractor-piled gorse patches. Moderately infested areas which had been previously had removed and had vigorously resprouted were treated, and medium-size plants at the edge of a disked area were sprayed. The rest of the headlands was walked in transects to catch scattered individual plants. [Tina, would you comment on the effectiveness of the treatment in the different situation.]

2. Burning

Burning of large gorse patches has been used in the past in Jughandle, at least in the 1980's and perhaps (?) earlier. A large gorse field off Caspar Point Road also caught fire and burned quite completely in 1988. According to Guil Dye, a Caspar Point homeowner, burning of gorse patches that become established in pastures is standard procedure in Scotland.

Burning destroys the tops and shocks the plants, but does not kill the roots. The uniform experience is that the gorse eventually regrows from the roots. Also, at least one source indicates that burning helps break the dormancy of seeds. In Scotland, burning is done in pastures; thus grazing animals eat the sprouts. In Caspar and Jughandle, burned land has heavily resprouted. Where followup treatment has not occurred, a burned patch returns to its original state within a very few years.

3. Covering with Plastic

Several experiments have been tried using black plastic to cover areas where tops have been removed manually or by mowing.

Jughandle farms has had several areas covered with black plastic for over a year. According to Tina Fabula, who visited the test recently, there is still living gorse under the plastic (perhaps new sprouts?).

I have used plastic on two occasions, once to cover the crown a mature plant that had been cut back many times and mowed over regularly but still survived. I covered it with a 10' square of black polyethylene for about six months. The plant died. A second time, I put down two overlapping six-foot wide strips of woven nursery cloth on a field that had an extremely dense gorse infestation (which had been bushhogged). The length was about fifty feet. I left this for

several years, during which time the adjacent gorse grew back up and flowered. By the end of the second year, much debris had accumulated on the cloth, and gorse seeds had sprouted and sent roots through the cloth. At that point, I removed the cloth. There were no living older plants and very few seedlings emerged in the first year. More have now appeared, perhaps because of seeding from the adjacent plants, but the level of infestation is much less than in the adjoining, untreated field.

4. Biological Control

There are various parasites of gorse that can be of assistance in a long-term control effort, but they will be of little immediate help in dealing with the crisis at hand.

Tasmania is undertaking a major effort to establish biological control species as an aid in an overall control program. A contact for this program is Dr. John Ireson, Senior Entomologist, Tasmanian Institute of Agricultural Research (I have written to him and asked him to join our egroup). A description of this program is at

<http://www.microtech.com.au/mvws/gorsemite.htm> .

Collecting more information on biological control should be an important part of developing a long-term control program.

5. Herbicides – Cut and Paint

Foliar spraying of herbicides has not been used to any appreciable extent on mature stands of gorse. The amount of herbicide used would be enormous and the general opinion seems to be that the effectiveness would be questionable.

A different way of using herbicides is to cut the stems of the plant and very quickly, within a few minutes at most, to paint the stems with undiluted herbicide. This “cut and paint” method was used about a year ago in a gorse removal effort in Bodega Bay conducted by Peter Warner, an ecologist. He used full-strength glyphosate (Roundup) and triclopyr (Cooks, also sold as Garlon). He reports almost 100% of the treated plants were killed by both chemicals. He made stem application of herbicides on all plants other than seedlings. He removed seedlings by hand pulling, weed forks, etc. He has not yet returned this winter but expects to find a few unkilld plants and new seedlings.

A relatively new herbicide, imazapyr (tradenames, Chopper, Arsenal, Contain) may provide a superior alternative to glyphosate and triclopyr. According to CDF employee Walt Decker, this is being used to kill tanoaks in local forests and has significant advantages over other herbicides that have been used. Very small amounts are required. It can be injected into the stem rather than needing to cut and paint the stem. It is essentially non-toxic to fish, birds, bees, and mammals (although long-term studies are not available). It is bound tightly to the soil and thus unlikely to move down into aquifers. It is non-toxic to conifers but toxic to most other plants. I have no information on its effectiveness on gorse.

For more information on these herbicides:

Glyphosate: <http://infoventures.com/e-hlth/pesticide/glyphos.html>

Triclopyr: <http://infoventures.com/e-hlth/pesticide/triclopy.html>

Imazapyr: <http://infoventures.com/e-hlth/pesticide/imazapyr.html>

B. Isolated Gorse Plants and Small Patches

Throughout Jughandle, individual plants and small patches are widely dispersed around the major gorse patches. Much of the southern half of the headlands area south of Jughandle Creek and all major solid patches are surrounded by this type of gorse infestation.

Treatment alternatives that have been tried are:

1. Manual Removal

Manual removal generally is done using mattocks to attempt to dig out as much of the plant and roots as possible. Special “weed wrenches” are also sometimes used, but are much slower and difficult to use. Manual removal been used repeatedly in Jughandle Reserve south of Jughandle Creek. Inmate crews and volunteers have worked there (I believe) every year since systematic control efforts were halted. This effort has proven completely ineffective. Gorse infestation has increased every year. I believe that this has occurred for several reasons: First, some part of the root is left in the ground, especially on larger plants (over 1'). Second, the earth is disturbed, effectively planting gorse seeds in the soil. The following year, there will be more sprouts.

My own experience in controlling gorse spreading across a neighbor's small field (approx 50' by 50') toward my property line has been much better than this. I have gone into the field each spring and matted out all of the plants that I could see, generally only 10 to 20 plants, none over 18" tall. I've done this for 10 years, and during that time, no solid gorse patches have developed. Possible reasons may be: 1) the field is covered with tall grass that is never mowed, perhaps shading out some sprouts; 2) there are some trees to the south, providing additional shade; 3) perhaps this field has never had solid infestation and thus has a limited seed inventory.

2. Herbicides

Parks Department carried out a pesticide spray in September, 1994. Garlon 4 (chosen because it is not toxic to grasses) was applied to in a number of ways, including treatment of individual plants scattered throughout the Reserve. My own observation of south Jughandle was that the spray was effective at killing the top growth of the plants that I saw, some of which were several feet tall. I did not inspect the plants carefully; so I don't know whether all were killed or resprouted from the base. The next year there were fresh gorse plants growing in the treated area, but this would be expected even if sprayed plants were killed. Many seedlings would not be spotted because of high grass. These would become significant plants in the following year.

Cut and paint on isolated plants has not been tried in Jughandle, to my knowledge. It would be more time consuming, but according to Peter Warner, is feasible and effective.

Short-term Gorse Control in Jughandle

Gorse is so rampant within Jughandle that immediate action is needed to contain its spread. A long-term, sustained program of control is essential to long-term success, but effort now should concentrate on short-term measures.

Preliminary Conclusions

Some tentative conclusions emerge from reviewing the results of all of the approaches that have been tried so far:

1. Digging: all methods that involve disturbing the earth (rototilling, bulldozing, mattocking) seem to create perfect conditions for germination of seeds; thus while they cut down the gorse immediately, they create greater numbers of smaller plants to deal with in the future. Area treatments kill all native as well as exotic plants.

In areas previously rototilled, rototilling again will not do further damage to the ecology, but there still remain questions about its effectiveness. Although it will kill existing small sprouts, it also tills the earth and places new seeds into conditions favorable for germination. Experience is that gorse still abounds in fields that have been rototilled numerous times.

2. Burning does not kill plants, creates conditions favorable to new growth, and activates gorse seeds.
3. Grazing does not seem a desirable control method for Jughandle. Animals would eat desirable native plants as well as gorse. Fencing would be required, which would detract from the undeveloped quality of the Reserve.
4. Plastic is too untested at this point to rely on heavily. Furthermore, covering large areas of Jughandle would be unsightly. Furthermore, securing plastic over large areas sufficiently to resist the very strong coastal winds seems quite difficult. Plastic deserves more investigation, but doesn't seem appropriate as a major part of the immediate, urgent control effort.

If the above methods are ruled out as major measures for controlling established gorse stands, we are left with two short-term measures: herbicides and bushhogging. Hand removal of small plants also can play a role in the overall control program.

Attacking Established Gorse Stands and Mature Plants

1. Herbicide treatment

The most hopeful control method for mature gorse plants, whether individual, in clusters, or in stands is "cut and paint" of herbicide (glyphosate and triclopyr), or stem injection of imazapyr, if this can be found to be effective on gorse.

As compared to spraying on foliage, direct application to the stem greatly reduces the amount of herbicide used and essentially eliminates possible concerns about aerosols, ground and water contamination, and ancillary killing of desirable plants. Unless there were significant technical or economic advantages to foliar spray, direct stem application would clearly be preferable. There appear to be no technical advantages to foliar spray; if anything, direct stem application is more effective. And, the economic advantages do not seem sufficient to outweigh its other advantages in most situations.

Peter Warner's experience suggests that the cost of using direct stem application as the primary control method in Jughandle would fit within Parks control budget. As shown in a note at the end, a very rough estimate of treating all of Jughandle west of Hwy 1 is \$60,000. This is less than half of the \$140,000 that Parks has been allocated for exotic plant control in Jughandle. It needs to be noted, though, that this allocation is for three years and is to cover Park personnel costs as well as contract costs. Given this, \$60,000 may not fit within the current allocation. Still, it seems in the range of an acceptable cost. Given sufficient public concern, the legislature seems likely to be willing to budget additional money in coming years.

Recommendation: Given the potential advantages of direct-stem herbicide treatment over other methods, Parks should make direct-stem treatment its primary method of attacking gorse in Jughandle. It should move as quickly as possible apply this control method on a major scale.

What should be done first?

The first priority in the direct-stem control effort should be treating isolated plants and small clusters. Each of these is a source of "infection" that will spread gorse and add to the treatment burden next year. Gorse is flowering now and will soon begin setting seeds. Removing these plants now will lessen next year's problems.

Scattered and isolated plants are only a small percentage of the total gorse population of Jughandle, and because they are smaller and more easily accessible than those in solid stands, they can be treated with much less effort. There is no doubt that the benefit/cost ratio of treating the small clusters and isolated plants makes them the preferred first target of the control effort.

Is there a place for foliar pesticide spray?

Direct-stem treatment is clearly superior environmentally. Its costs seem within reason. The only reason I can think of for using foliar spray is that it can be done much more quickly than direct-stem application. This is not compelling, unless Parks cannot get its direct-stem program underway quickly. Then, rather than letting clusters spread without treatment, foliar spray should be considered as a one-time emergency measure. The herbicides involved are used routinely by private landowners around Jughandle, with less knowledge and care than a professional person. Scientific evidence indicates that these pesticides are essentially non-toxic to mammals, birds, and fish. There are, of course, uncertainties with all chemicals, but most of us use more toxic chemicals routinely (gasoline, bleach, detergents, for example). Hopefully, though, Parks will be able to act quickly enough so that foliar spray need not even be considered.

2. Bushhogging

Depending upon the rate at which the direct-stem treatment could be done, bushhogging may be a useful part of the overall control program. Given the slow rate at which Parks has been moving on gorse, there seems a significant chance that only a small part of the infestations will be able to be treated this year.

Bushhogging could serve as a quick, low-cost measure for removing the top growth of solid gorse stands. This would be a temporary measure and would do nothing to reduce the underlying gorse infestation in the area. It would, however, 1) immediately reduce the significant fire hazard of solid gorse stands, and 2) reduce the rate of spread of gorse. Gorse seeds are shot out from the seed pods up to 20'. Thus, a gorse patch 100 feet across will increase its area by almost 50% in a single year. Cutting the gorse to the ground will prevent this from happening. Bushhogging turns the gorse plants into mulch; thus no burning or moving of the plants is required.

A question that needs to be answered is whether bushhogging will make follow-on control more difficult or make direct-stem treatment infeasible in the future. Casual observation suggests that this is not the case. Fields that have been bushhogged regrow into major gorse plants within about three years. The fields appear to consist primarily of good-sized plants that could be killed with direct-stem treatment. Small plants appear to be largely shaded out. If this is the case, bushhogging would buy about three years of time. As the plants grew back, the edges could be treated to prevent growth of the patch by shooting seeds, until plants in the patch grew to the appropriate size for direct-stem treatment.

The statements in this section are very preliminary and tentative. A serious evaluation would need to be done before using bushhogging as a major backup method.

Notes

A First Cut at Estimating the Cost of Direct Stem Application of Herbicide in Jughandle

Peter Warner worked alone about 100 hours to treat approximately two acres of heavily infested land near Bodega Bay. He cut and treated about 1000 plants. Jughandle's infested land is much larger -- how much larger, I don't know. But, just to get a rough idea of the possible cost, assume that there are sixty acres of equivalently infested land in Jughandle (30,000 plants). There should be some economies relative to Warner in treating Jughandle (because of learning over time and possible division of labor), but assume that it takes the same amount of time per acre. The total hours worked to treat 60 acres would be 3,000 hours. Given labor rates in this area, it seems feasible to hire this done for \$20 per hour, or a total of \$60,000.

Gorse a Prohibited Plant

In parts of Australia: " Land owners in areas where furze is Regionally Prohibited must eradicate or control it on their land. Landholders in areas where furze is Regionally Prohibited

must take all reasonable steps to control it and prevent its spread on land and the roadsides which adjoin their land.” Similar policies exist in New Zealand.

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