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Maple Ridge: forest restoration in urban greenbelts

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Greenbelts are parks, undeveloped land and open space near communities. They are set aside to reduce urban sprawl and help meet environmental goals for clean water, air quality, fish and wildlife habitat. Maple Ridge has been effective in establishing greenbelts throughout the Municipality. However, just because greenbelts are "green" it does not mean they are fully functional nor will remain as "green" we see them today. The greenbelts of Maple Ridge developed naturally. Most were logged for timber, others cleared for farmland. Tree rings show the earliest greenbelt examined was cleared in 1938. Portions include non-vegetated soils, open pasture, invasive plants and large amounts of brush. A serious ecological problem common to all Maple Ridge greenbelts is they are treed in vast stands of red alder. Red alder is a native, pioneering tree that establishes on mineral soil following disturbance. Once established, alder grows quickly forming dense stands. Alder is short-lived. Up to 60% of the alder in some Maple Ridge greenbelts is dead or dying. It is expected that in 20-years the majority of alder we now see in the greenbelts will be dead, leaving behind leafless and decaying snags that poise risk to people and the watersheds they initially protected.

Recommendations:

- plant areas in Polygons 24 - 33 using species given in Tables 1- 10
- areas specified include those where planting is needed to meet greenbelt goals for water quality, soil stability, fish and wildlife habitat
- replacing dead and dying alder using ecologically suitable tree species is the principal treatment
- areas of open pasture, grassland, and bare-ground are prescribed for planting
- mixed stands that include conifer and other deciduous trees such as maple and cottonwood are recommended for planting where suitable gaps are present

- tree species recommended for planting include: Sitka spruce, western hemlock, Douglas-fir and western white pine
- "cluster" planting in gaps is recommended for highest survival and reduced maintenance. Monitor sites annually and brush as required for fastest height growth. "Variable density" planting is recommended for grasslands, empty fields, and areas without vegetation
- site preparation may require the removal of some trees where gaps in over-story are lacking. Conifer need abundant light for healthy growth. Gaps of up to 20 m in width are recommended. A high percentage of alder are already dead or dying. Gap size will increase naturally as die-off speeds in coming years
- where dead and dying alder are removed, and within the proximity of a stream, surplus wood can be directionally felled toward the stream to make it available for short-term use by fish

Alder has a place in urban greenbelts. Restoration is not intended to alter it's ecological role. Alder is one of few trees that puts nitrogen back in soil and can rapidly shade temperature sensitive fish streams. Alder's detriment though, is it's short-life, and all too rapid growth. Conifer trees - the real giants of the coast rain forest, and those responsible for maintaining and creating fish habitat, soil stability and water quality in perpetuity - do not regenerate under alder. This is due to alders fast growth and tendency to propagate in dense stands. Once alder dominates a site, it snatches all available light from understory trees and brush, slowing their growth or suppressing it entirely. Alder grows to 40 to 60 years, sometimes longer depending on the area. This time frame allows the brush beneath alder to become fully mature and dense. As each alder tree dies, more light becomes available to the brush, intensifying the problem. Eventually, only brush and the residual conifers that may have established at the time the alder began growing remain. Conifers can not establish under brush on their own, making it impossible without planting to replace the dead over-story trees. Large areas of Maple Ridge Greenbelts are dominated by alder (Maps 1-10). Left unplanted, these portions would become treeless expanses of blackberry, vines and other shrubs.

cedar grove within a Maple Ridge Greenbelt

Greenbelt Restoration by ERA

In cooperation with the Municipality of Maple Ridge, ERA Ecosystem Restoration Associates Inc. (ERA) is replanting areas within the Maple Ridge Greenbelts. Restoration is funded by ERA and Canadian corporations participating in the EcoNeutral program, whereby ethical organizations voluntarily offset their residual carbon dioxide emissions, by sponsoring the restoration of healthy ecosystems. These restored ecosystems remove and store vast tonnages of carbon dioxide from the air, over their lifetimes, and in so doing, provide a range of ecosystem benefits. While thriving alder do "store" carbon they become a "net emitter" of carbon dioxide when they become old. Because of their relatively short life, storage of carbon in alder is relatively brief. In

above: "template" grove near 236th Street containing western red cedar, western hemlock, Douglas-fir and Sitka spruce

greenbelts where long-lived conifers are needed they store large amounts of carbon for hundreds if not thousands of years.

"Templates" provide guidance in restoration

Greenbelts are special places. We see them across the fence, they contain paths worn by intrepid visitors, a small pink pail lodged under a log tells us our children explore them. Under the shade of trees, the movement of a water spider is easily confused by the flight of fingerling coho salmon and cutthroat trout. People have a vested interest in their greenbelts and need assurance the planting proposed is based on sound environmental principals.

In BC, techniques employed in ecosystem restoration derive their basis from natural **"templates"**. Unlike areas where original forests were long ago logged, BC still contains many unlogged watersheds and stands of old-growth forest that provide forest ecologists with information as to tree species composition, density and size of trees in the stand. By linking that to topography and local climate they know what to expect from similar sites elsewhere and what can be achieved through ecosystem restoration. Maple Ridge greenbelts are young in the natural scheme of things, but careful investigation can reveal their potential. A short walk into the forest at the end of 236th Street will take you to towering western red cedars, Douglas-fir and western hemlock (above). Not far away is a beautiful large diameter Sitka spruce. The trees are about 95-years old which means they were too small at the time of logging for being cut. After logging they were exposed to direct sunlight and grew rapidly, achieving up to 22 mm in diameter growth per year for a significant

period of time. The largest diameter tree in the grove is a western red cedar at 99 cm at diameter breast height (dbh). With western hemlocks to 65 cm and Douglas-fir to 72 cm dbh, the stand is an impressive example of what is possible. Not far from the end of 234A Street, and a short walk across a small field, over and just downstream on Cottonwood Creek are several large diameter Sitka spruce. One is an impressive 1.48 m diameter tree that exemplifies what was once present. It is trees like this one that produced the highly productive fishery habitats once contained in Cottonwood Creek. Trees like this can be produced through restoration.

Achieving tremendous size requires abundant light. A Douglas-fir stump on the edge of Maple Ridge greenbelt shows this. The diameter of the stump is 109 cm. Ring counts reveal the tree was only 26 cm at the age of 62-years. After logging in 1956, the tree gained 86 cm over the next 50-years for an increase in diameter growth of over 4X after exposure to full-sunlight. It is obvious from these trees that Maple Ridge Greenbelts are highly productive and will respond well to restoration.

Certification of Prescriptions

The restoration prescriptions contained in this document were prepared and are certified by V.A. Poulin, a Qualified Environmental Professional on behalf of ERA Ecosystem Restoration Associates Inc.. Mr. Poulin is a Registered Professional Biologist who specializes in riparian management and ecosystem restoration. He has completed 47 riparian assessments for industry and government and treated 350 hectares of riparian forest on 70 kilometers of BC rivers and streams.

Mr. Poulin with the assistance of Bart Simmons, ERA, assessed each of the riparian polygons proposed for restoration. Work included analysis of high-quality aerial photography provided by Maple Ridge Municipality and field visitations to representative areas within each of the proposed work sites. Each area was evaluated on the basis of stand type and need for planting. Tree species selection considered location, site series, and surrounding vegetation. Maps 1-10 show units of similar vegetation type and mark points of interest with respect to the project. Tables 1-10 explains the treatment recommendations for each unit. It is not possible due to tree cover to provide certainty with respect to the abundance and species of understory trees making it possible that in some areas adequate conifer understory may be present. Should this occur planters are advised to move to locations where stocking has greater benefit.

Alder Dominated Sites

Alder dominated sites include those listed as PSd and YFd. Foresters label groups of trees by “stand structure” of which these are two. The first two letters designate the class of “stand structure” and the last letter the type of trees in the stand. PSd is a pole-sapling stand containing nearly all deciduous trees. Deciduous trees drop their leaves in fall and include trees such as alder, cottonwood and maple. Pole-sapling trees are densely stocked, usually >10 m tall, and young in age. YFd is an older version of the same stand that has become a young forest. These stands are most problematic as all deciduous trees are relatively short-lived with alder being the shortest. All PSd and YFd sites are prescribed for planting.

Mixed Wood Stands

YFm and MFm designate young (Y) and mature (M) forests containing a mixture of deciduous and conifer (evergreen) trees. Most mixed wood stands contained within the greenbelts were considered adequately stocked and thus not requiring planting. However, if during implementation gaps close to greenbelt streams are found that lack stocking, planting should be done.

Conifer Stands

YFc and MFc designate young and mature forests containing conifers. All such stands are considered adequately

stocked and not recommended for planting. Greenbelt conifer stands in Maple Ridge are stocked with Sitka spruce, western red cedar, western hemlock and Douglas-fir. All are excellent long-lived trees that meet every requirement for healthy, full-functioning greenbelts. They offer long-term ecological solutions for stream bank and channel stability, erosion control, fish habitat, and storm water retention.

Grasslands and Open-space

Areas lacking vegetation and those without trees are designated IN or SH (initial, shrub) and recommended for planting. IN is the earliest vegetation stage and applied to grasslands and pastures that lack obvious shrub or tree cover. SH is given to areas where dense shrubs were found during ground surveys. Patches of SH may be present in other stand types due to an inability to accurately distinguish them from some deciduous trees when viewed using only aerial photographs.

Fish Habitat Augmentation

Kanaka Creek is an important Lower Mainland fish stream containing salmon and trout.

top: alder used to augment woody debris by directional felling (Keogh River restoration site by VA Poulin), **lower:** fallen alder snag adds natural wood to clay/cobble bottomed greenbelt stream

Young fingerlings were seen in many greenbelt streams. Maps provided by the Municipality show locations of natural and released fish illustrating fish can be expected in all primary and secondary streams except above some impassable road culverts. Logging and tree removal for agricultural and domestic development have taken a toll on Kanaka Creek. Any fish habitat survey would show the system having been degraded by past land-use. At most locations reduced habitat capability was evident. Lacking are deep pools, gravel substrates, stable banks and any measure of large woody debris.

Conifer seedlings require abundant light. To get light, most planting sites will require some tree removal. When trees are removed close to a stream, they become an opportunity to add woody debris to the aquatic system. Stable in-stream debris is the cornerstone of habitat for fish such as coho salmon. Most fish benefit from wood, but coho thrive best where wood is abundant. Where directional felling toward a fish-bearing channel is possible, augmenting in-stream woody debris is recommended. Ensure all branches and wood subject to being moved by the stream is removed and placed in a location where it can not re-enter the stream. Alder rots quickly, but will provide fish value for 10 or more years when the bole or larger branches are added. Single and multiple-tree placements work. Use live trees, old stumps and changes in bank elevation as “pinch” points to prevent or minimize movement after felling. Once in the channel, allow the wood to function as natural tree fall.

Planting Mixtures

Mixtures prescribed for planting are given in tables 1-10. Sitka spruce, western red cedar, and Douglas fir make up the majority of plantings with Sitka spruce and western red cedar selected for all riparian sites and where shade is highest. Douglas fir is prescribed for the driest sites and those with full-sunlight including sites lacking alder over-story, grasslands and open-space. Western white pine is recommended as a companion planting to Douglas fir in some areas. White pine is not present in the greenbelts, but is a suitable site series tree that will add biodiversity to the mix of trees being planted. Likewise, quaking aspen is prescribed for a small area where this species has potential to grow well.

Black cottonwood is a suitable replacement for alder and offers significant benefit in riparian areas. It has not been considered here only because

cottonwood is abundant in Maple Ridge Greenbelts. However, cottonwood can be added to sites where Sitka spruce and western red cedar are recommended. Cottonwood is an excellent companion tree to spruce where it is often planted to minimize risk of damage by spruce leader weevil. Leader weevil was observed on some spruce trees planted in yards, but not seen in the Greenbelts.

Plantings under alder are recommended done in “clusters”. Clusters are groupings of trees rather than individually spaced trees. ERA is using cluster planting in Maple Ridge Parks and is familiar with opening size and brushing requirements. Open fields, pastures, and grasslands are recommended planted using variable density spacing. Areas are completely planted (uniform), but to irregular boundaries and at densities ranging from light to heavy. The affect is a naturally reproduced stand. Site preparation in these areas may require mechanical equipment.

Planting Time

Plant early to late fall or later winter to early spring using largest available planting stock.

Brushing and Fertilizing

Alder removal results in intense brush competition. Clusters should be monitored annually and brushed to maintain leader height above competing brush. Fertilize seedlings with a high phosphate fertilizer such as bone meal at the time of fertilizing. Combine with a slow-release fertilizer (10 to 30 g per tree depending on stock size).

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August 04, 2006

Table 1. Treatment recommendations for riparian polygon 33

Object No.	RIP	Stand	Treatment	Comment
1	33	SH/bberry	NT	area generally planted by adjacent owners, heavy bberry
2	33	IN/grass	PL	medium bench floodplain, PL SsCwAc
3	33	PSd/Dr	PL	young alder stands - Pl(SsCwFd)
4	33	IN/grass-shrub	PL	non-treed riparian site plant throughout (SsCwFd) consider At
5	33	YFm/CwSsHwMbDr	NT	acceptable stand heavy to conifer
6	33	PSd/Dr	PL	young alder stand - go larger openings to establish Fd
7	33	SH/bberry	PL	work entire riparian corridow using gaps PL SsCw
8	33	YFm/SsCwHwMbDr	NT	hillside stand with good conifer
9	33	PSd/Dr(MbAc)	PL	60-70% dying alder PL SsCwFd in larger openings
10	33	PSd-SH/Dr	PL	extensive young Dr -bberry (slide area) PL SsCw
11	33	YFd/DrMd(Ac)	PL	extensive young forest of deciduous trees PL SsCw
12	33	YFc/CwFdHw	NT	disbursed patches of mixed conifer throughout
13	33	YFm/CwFdHwDrAcMb	PL	good opportunities close to stream PL SsCw
14	33	YFm/CwFdHwDrAc(Mb)	PL	very high fish densities some natural openings PL SsCw
15	33	PSd/AcDr	PL	Ac dominant in both stands PL SsCw in 1TL openings
16	33	YFd/DrMb to pure Dr	PL	often entranched, clay bottom, LWD deficient, PL SsCw
17	33	YFm/DrMbFdCwHw	PL	medium bench grass-sedge complex PL Ss
18	33	YFm/Cw(DrMb)	NT	excellent examples of Cw growth - 1 m dbh trees
19	33	YFd/Dr(Mb)	PL	dead and dying Dr throughout, PL SsCw
20	33	YFc-m/CwHwDrMb	NT	one good plantable gap, but generally acceptable conifer
21	33	YFc/CwFdHw	NT	weak conifer corridor
22	33	YFd/DrAc	PL	mostly deciduous with dead and dying, PL SsCw
23	33	YFd/DrAc	PL	large contiguous stand of deciduous, PL SsCw
24	33	PSd/AcDr-YFd/AcDr	PL	large contiguous stand of deciduous, PL SsCw
25	33	MFc/Fd	NT	template Fd stand
26	33	YFd/DrAc	PL	large contiguous stand of deciduous, PL SsCw
27	33	steep hillside	NT	steep hillside causing operational difficulties
28	33	MFm/FdCw(Hw)DrMb	NT	NT patches of good conifer
29	33	SH-PSd/bberryDrMb	PL	overstory gets more dense upstream, work close to stream by PL SsCw
30	33	YFm-YFc/CwFd(SsHw)DrAcMb	NT	disbursed patches of conifer with 10 - 15 m wide gaps and opening containing 53
31	33	YFd/DrAc(Mb)	PL	central core with overstory of Dr, Ac increases as does Mb, PL SsCw
32	33	SH/bberry	PL	several good "template" roadside gaps when planted will make for good viewing
33	33	Ac snags	NT	numerous large full standing Ac snags, some felled, retain as WT's and NT
34	33	PSd/DrAcMb	PL	central core with overstory of Dr, Ac increases as does Mb, PL SsCw
35	33	YFd/DrAc(CwHwMb)	PL	opportunties in largest gaps for PL SsCw
36	33	YFc/CwFd(SsAcHw)	NT	good conifer densities along established lines
37	33	YFd/DrAc	PL	concentration of dead (D2) and dying (D1) alder, heavy to Mb, PL SsCw
38	33	NA	NA	large Mb snag retain as WT
39	33	NA	NA	exceptionally fine Ss, 1.48 m in dbh, worth viewing, primary diameter growth last 60 years

Table 2. Treatment recommendations for riparian polygon 32

Map No.	RIP	Stand	Treatment	Comment
40	32	YFd/AcDr(MbSs)	NT	leading species large diameter Ac
41	32	YFd/DrAcMb	PL	mixed YFd to PSd and brush, PL SsCw
42	32	YFc/CwFdSs(DrAcMb)	NT	good to moderate Cw
43	32	NA	NA	map is incorrect, area proposed for housing development, check boundaries
44	32	YFd/DrAcMb	PL	stand extends across stream to PSd/Dr PL SsCw
45	32	PSd-SH/Dr	PL	area extensive PSd/Dr PL FdCwSs go wide
46	32	YFm/CwSsFdMbDrAc	NT	good FdCw throughout
47	32	YFd/DrMbAc	PL	extensive stand, extends across creek becoming PSd/Dr near E edge at 113 Ave
48	32	YFc/FdCw	NT	disbursed patches of conifer leading species FdCw
49	32	YFd/MbDrAc	PL	a continuation of 47 but with increased Mb, minor FdCw disbursed throughout, large treatment area, PLSsCw
50	32	YFc/FdCw	NT	good patches of FdCw on west edge of polygon

51	32	YFc/FdCw	NT	similar but smaller patches of FdCw on east edge of polygon
52	32	YFd/AcDrMb	PL	extensive stand that ties in with 49, heavy to Ac and Dr, PL SsCw
53	32	YFd-PSd/DrAc	PL	extention of deciduous corridor with abundant D1-D2 alder, PL SsCw
54	32	NA	NA	restoration site cluster planted using Cw, well stocked with good growth, shaded

Table 3. Treatment recommendations for riparian polygon 31

Map No.	RIP	Stand	Treatment	Comment
55	31	YFd/DrAc(Fd)	NT/PL	S of creek Dr is D1-D2, but too narrow. PL a bberry opening and PSd near 110 Ave
56	31	SH/bberryMf	PL	N of creek 80% bberry/sedge/grass PL SsCw
57	31	SH/willowCw	NT	restoration site heavily planted to weeping willow, Ac, Cw and other shrubs. 100% shaded
58	31	IN/grass	PL	variable density plant Fd over entire unit add minor CwSs
59	31	MFm/CwFdDrMb(HwSs)	NT	very nice stand, some gaps could be filled
60	31	SH/bberryDrMb	PL	dense bberry with D2 Dr on outside PL gap SsCw
61	31	YFd/DrMb	PL	PL large gaps SsCw, numerous D2 Dr
62	31	PSd/Dr	PL	conifer on private property, Dr to west and off 112 Ave. Dr - D1 condition
63	31	YFd-PSd/AcDr(Mb)	PL	mixed stand with stages PSd, Yfd, SH, DrMbwillow and others, PLSsCwFd
64	31	YFm-YFc/Cw(Fd)	NT	looks to be a good stand, small gaps
65	31	YFd-PSd/DrAc	PL	continuation of 63 on east side bank, dense PSd on west, PLSsCw with Fd added east of creek
66	31	YFd-PSd/DrAc	PL	same stand as 65 extended north
67	31	YFm-YFc/Cw(Fd)	NT	several minor groups of edge conifers

Table 4. Treatment recommendations for riparian polygon 30

Map No.	RIP	Stand	Treatment	Comment
68	30	YFc/conifer	NT	cultivated conifer patch
69	30	IN-PSd/grass to PSd/DrAc(Mb)	PL	old property gone to grass, shrubs and PSd. Mostly shrubs along creek, PLFdCwSs
70	30	SH/bberrywillow to PSd	PL	heavy bberry with some weeping willow and Dr, no conifer, PLFdCwSs
71	30	YFc/SsFdCwHw(Dr)-Sh/bberry	PL	excellent large conifer on site, but 50% or more area in bberry, grass, some shrubs
72	30	NA	NA	residential within greenbelt NT
73	30	YFm/DrAcMbScCw	PL	disbursed single tree conifer within expanse of YFd, PLCwSs - excellent Ss in area
74	30	NA	NA	residential within greenbelt NT
75	30	YFc/CwSsFd	NT	disbursed patches of conifer with SsCw becoming CwFd above plot 16
76	30	YFd/DrAcMb	PL	large expanse of 48-year old Dr, top end looks to become heavy to bberry and Ac/Mb
77	30	NA	NA	ravine steeply sloping to 86% in some areas, 50-60% throughout
78	30	YFm/DrAcMbFdCw	PL	unlike the lower patches of conifer in sites 75 conifer is less dense in this area, PLSsCw
79	30	YFc/CwSsFd	NT	tight patch of conifer just inside road, outer trees AcMbDr
80	30	SH-PSd/Dr top end YFd	PL	extensive section of riparian area that has regrown to bberry, Dr(AcMb) and other shrubs, PLFdSsCw
81	30	IN/grass	PL	old pasture PLFdPw
82	30	YFc/FdCw	NT	small conifer patch with mixed DrMb
83	30	NA	NA	fish release
84	30	YFm/DrAcMb(FdCw)	PL	large area containing widely spaced conifer but dominant to Dr, PLSsCw
85	30	YFm/FdCwDrAcMb	NT	heavy to conifer
86	30	YFc/FdCw	NT	small conifer patch between residences
87	30	NA	NA	developed property
88	30	YFm/DrAcMb(FdCw)	PL	upper polygon heavy to MbAc, PLSsCw
89	30	IN/grass	NA	if applicable, uniform PLFdPw

Table 5. Treatment recommendations for riparian polygon 29

Map No.	RIP	Stand	Treatment	Comment
90	29	PSd/DrSasp	PL	residential strip of Dr, bberry, weeping willow, PLFdCw
91	29	NA	NA	residential within greenbelt, clarification required
92	29	NA	NA	residential within greenbelt, clarification required
93	29	YFd/DrMb(AcFdCwSs)	PL	corridor within residential acerage, YFd-PSd with large gaps of bberry, PLFd,Cw. Road conifer is NT
94	29	YFm/FdCwSsAcDrMb	NT	generally well stocked throughout, gaps offer some opportunity, typically NT, applies to all disbursed patches
95	29	IN/grass	PL	uniform PLFd(CwSs)
96	29	YFd/DrAc	PL	large segment of area, PLSsCw
97	29	YFm/DrAc(SsCw)	PL	good component of understory conifer in some areas, PLSsCw
98	29	YFm/DrAc(CwSsHw)	PL	some disbursed conifer throughout, PL gaps and larger contiguous segments of Dr using SsCw
99	29	PSd/DrAc	PL	area of small Dr, extends to east boundary, PLSsCw
100	29	YFm/DrAc(CwSsHw)	NT	disbursed patches of conifer
101	29	IN/grass	PL	uniform PLFd(CwSs)
102	29	NA	NA	residential within greenbelt, clarification required

Table 6. Treatment recommendations for riparian polygon 28

Map No.	RIP	Stand	Treatment	Comment
103	28	YFm/DrMb	PL	residential, but pockets within predominant conifer patches offer opportunity to PLFdCwSs
104	28	YFm/CwHw(DrMb)	NT	generally well stocked, may contain some gaps where present include in 103
105	28	NA	NA	residential within greenbelt, clarification required

Table 7. Treatment recommendations for riparian polygon 27

Map No.	RIP	Stand	Treatment	Comment
106	27	NA	NA	residential within greenbelt, clarification required
107	27	NA	NA	residential within greenbelt, clarification required
108	27	YFd/DrAc(MbHwCw)	NT	several small patches of disbursed YFd, but locations not conducive to treatment
109	27	Yfc-m/CwSsHw(DrMbAc)	NT	nice stand of predominantly conifer, central gap in shadow may allow some fill planting otherwise NT

Table 8. Treatment recommendations for riparian polygon 26

Map No.	RIP	Stand	Treatment	Comment
110	26	YFd/DrAcMb	PL	30-m gaps of YFd between concentrations of conifer, PLSsCw
111	26	YFm/CwSsHwFdDrAc	NT	dibursed patches of good conifer throughout

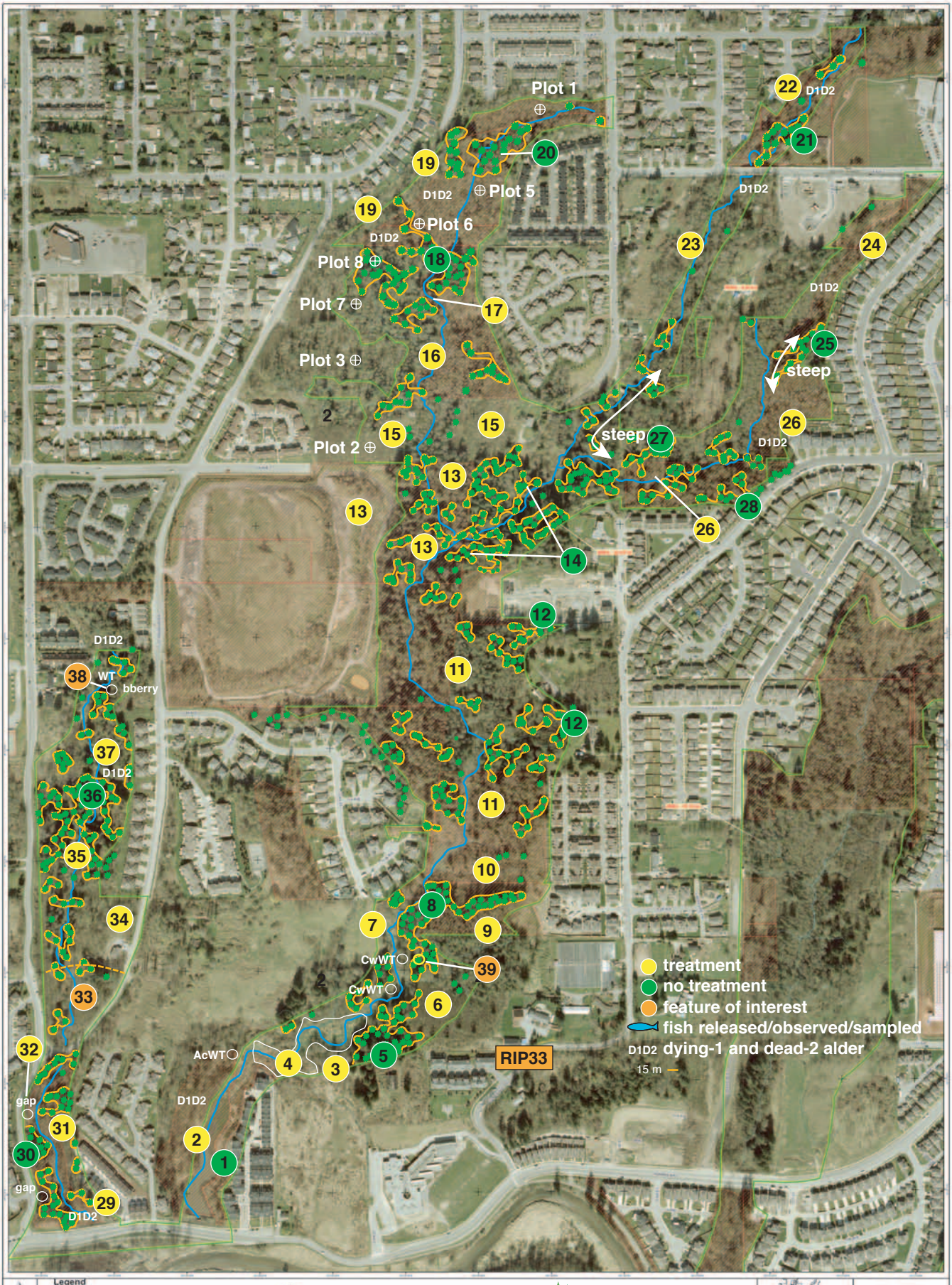
Table 9. Treatment recommendations for riparian polygon 25

Map No.	RIP	Stand	Treatment	Comment
112	25	PSd-YFd/DrMbAc	PL	large treatment area of near continuous deciduous, westerly riparian PSd, hillslopes Yfd, contains understory conifer, PLSsCw
113	25	YFm/FdCwDrMbAc	NT	generally well stocked disbursed patches of conifer
114	25	NA	NA	residential outside greenbelt, note road location through greenbelt
115	25	YFm/CwSsHwFdAcMb	PL	area within red dotted line was logged with all Dr removed, residual stand at 25-50 sph conifer, seeded to grass, PLFd
116	25	NA	NA	cabin within greenbelt, clarification required
117	25	YFm/CwSsHwFdAcMb	PL	areas occupied within same opening as 115, but with containing residual conifers, PLCw
118	25	NA	NA	point of interest, Cw stump 110 years old with a 104 cm stump diameter
119	25	NA	NA	point of interest, Fd stump 112 years old with a 109 cm stump diameter, 83 cm added in last 50-years (62-years old at 26 cm)
119	25	NA	NA	above Fd, best radial ring growth at 12 mm for a 24 mm diameter increase in one year, tree, best growth was post-logging (1944)
120	25	YFd/Dr(Mb)	PL	large treatment area of pure deciduous, continues to east boundry of polygon at retentiion pond, PLSsCw
121	25	IN-SH/grass,shrubs	PL	area varies in width from narrow to wider, fully exposed to light, uniform PLFd(Cw)
122	25	NA	NA	area contained is a storm water retention pond for an adjacent development
123	25	NA	NA	new road, right-of-way seeded to grass NT
124	25	IN-SH/grass, shrubs	PL	narrow area between road-right-of-way and YFc can be planted to Fd

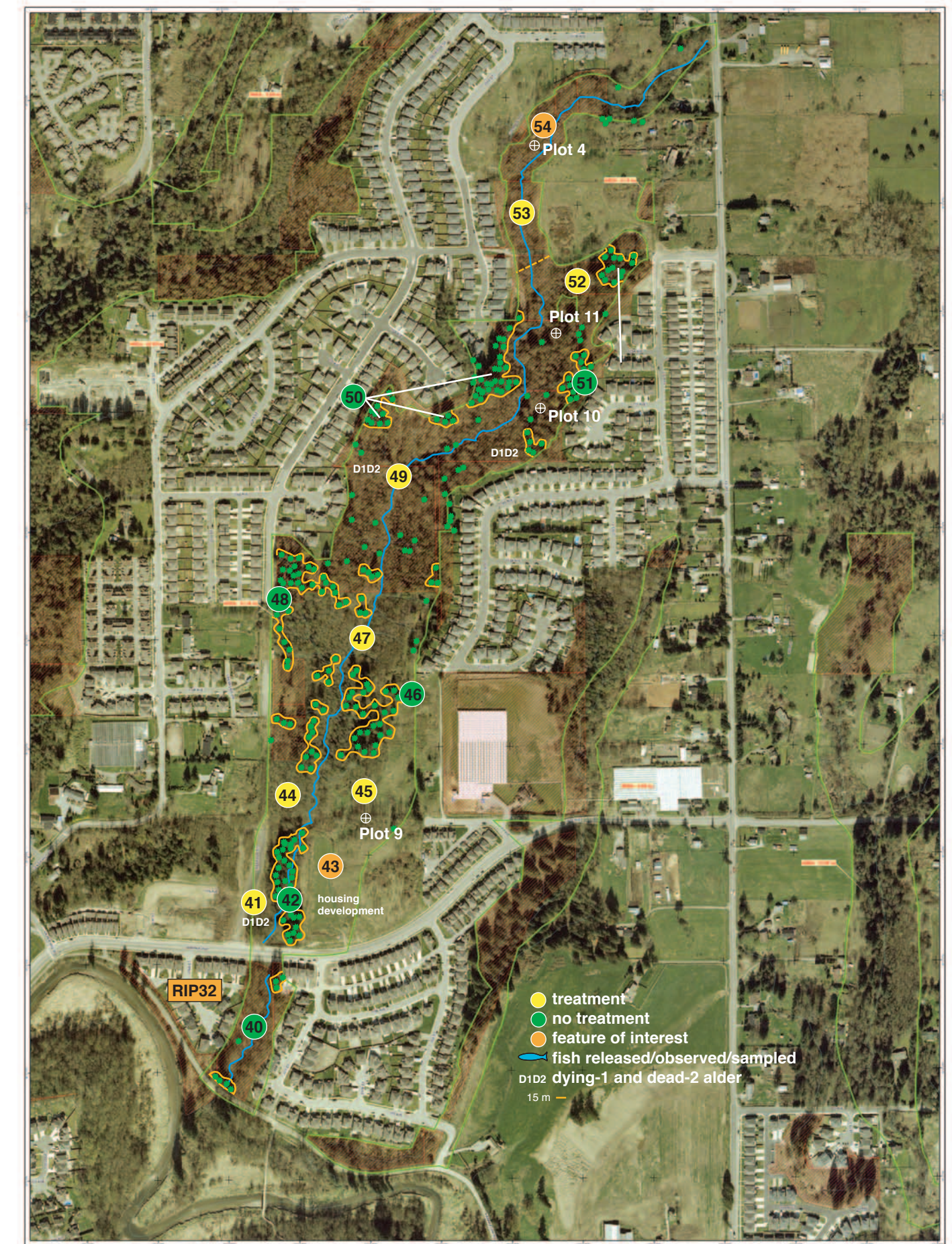
125	25	YFc/FdCw(DrMb)	NT	excellent narrow corridor of conifer representing "template" characteristics for the area
126	25	SH-IN/bberry,grass	PL	dense bberry and other shrubs over topping stream, bounded by fields of grass, PLSsCw in stream corridor, Fd in remaining area
127	25	YFd/DrAc(MbFdCw)	PL	large treatment area of nearly pure deciduous, continues to east boundry of polygon at retentiion pond, PLSsCw
128	25	YFm/FdCwDrAc	NT	two small, but distinct concentrations of conifer within this portion of the greenbelt, scattered conifer elsewhere
129	25	IN-SH/bberry,grass,shrubs	PL	dense bberry and other shrubs over topping stream, bounded by fields of grass, PLSsCw in stream corridor, Fd in remaining area
130	25	NA	NA	residential within greenbelt, clarification needed

Table 10. Treatment recommendations for riparian polygon 24

Map No.	RIP	Stand	Treatment	Comment
131	24	YFd-YFm/DrMb(AcCwHwFd)	PL	stand extends throughout RIP, Dr leading, DrD1 trees throughout (green with dead branches present) some D2 (dead), PLSsCw,
132	24	YFm/CwFdHw(DrMbAc)	NT	gappy and offering PL opportunties, but most gaps linked to 131
133	24	PSd/DrAc	PL	corner of greenbelt in young PS alder, stand extends into YFd contained in extention of 131, PLFdCw
134	24	YFm/CwFdHw(DrMb)	NT	two patches of mixed stand
135	24	YFd/Dr(MbCw)	PL	alder leading deciduous, D1 present
136	24	PSd/Dr(Cw)	PL	top end of RIP24, small stand of young Dr, very top portion is now cleared for a new road
137	24	D1-D2 alder	PL	area with high density of D1-D2 alder immediately adjacent to residental housing, PLSsCwFd
138	24	PSd/DrAc	PL	corner of RIP containing young deciduous, PLFdCw
139	24	YFm/CwHw(Dr)	NT	small corner patch of conifer
140	24	PSd/Dr	PL	corner of RIP containing young deciduous, PLFdCw
141	24	YFc-YFm/CwFdHw(DrMb)	NT	good corridors of conifer throughout, some steep hillsides
142	24	YFd/Dr(Mb)	PL	alder leading deciduous, D1 throughout, area includes isolated pockets bounded by 141, PLSsCw
143	24	PSd/Dr	PL	moderately large stand of PSd/Dr extends along boundary to storm-water retention pond, PLFd,Cw, priority site
144	24	IN/Dr	PL	young site with initial vegetation and beginning alder, PLFdCw, priority site
145	24	YFc-YFm/SsHw(CwDrAc)	NT	includes disbursed patches of conifer
146	24	PSd-YFd/Dr	PL	small patch of PSd with YFd behind, PLSsCw
147	24	IN/bberrygrass	PL	narrow strip with back to back housing, very open, dry, some plantings by residents, PLFdCw
148	24	YFd/AcMbDr	PL	area dominated by deciduous, contains D1 alder, PLSsCw
149	24	YFd/Dr(Ac)	PL	10-15 m strip of Yfd/Dr bounding 145, gaps in 145 may allow fill planting to stream, includes area on N side, PLSsCw



Riparian Polygon 33



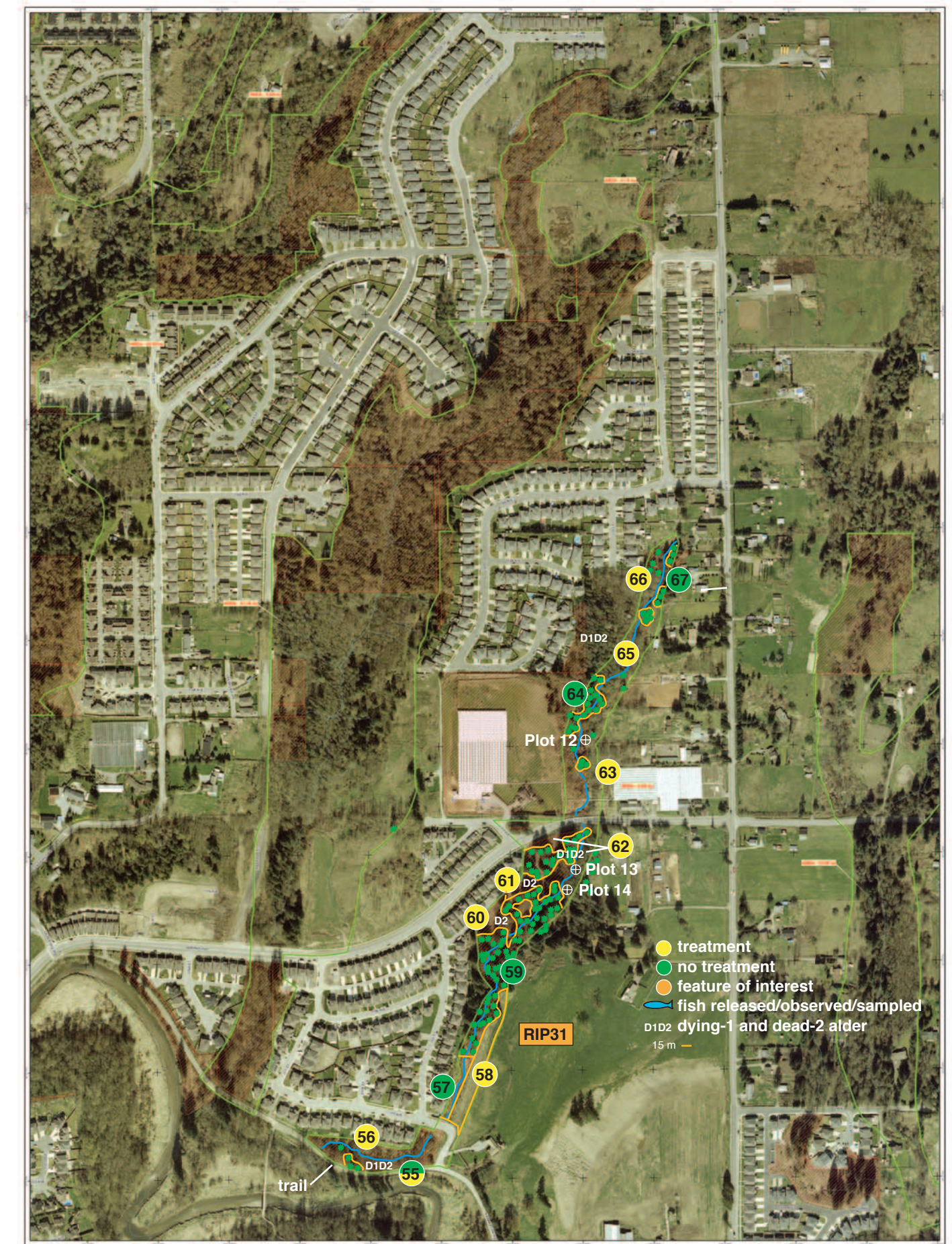
Legend

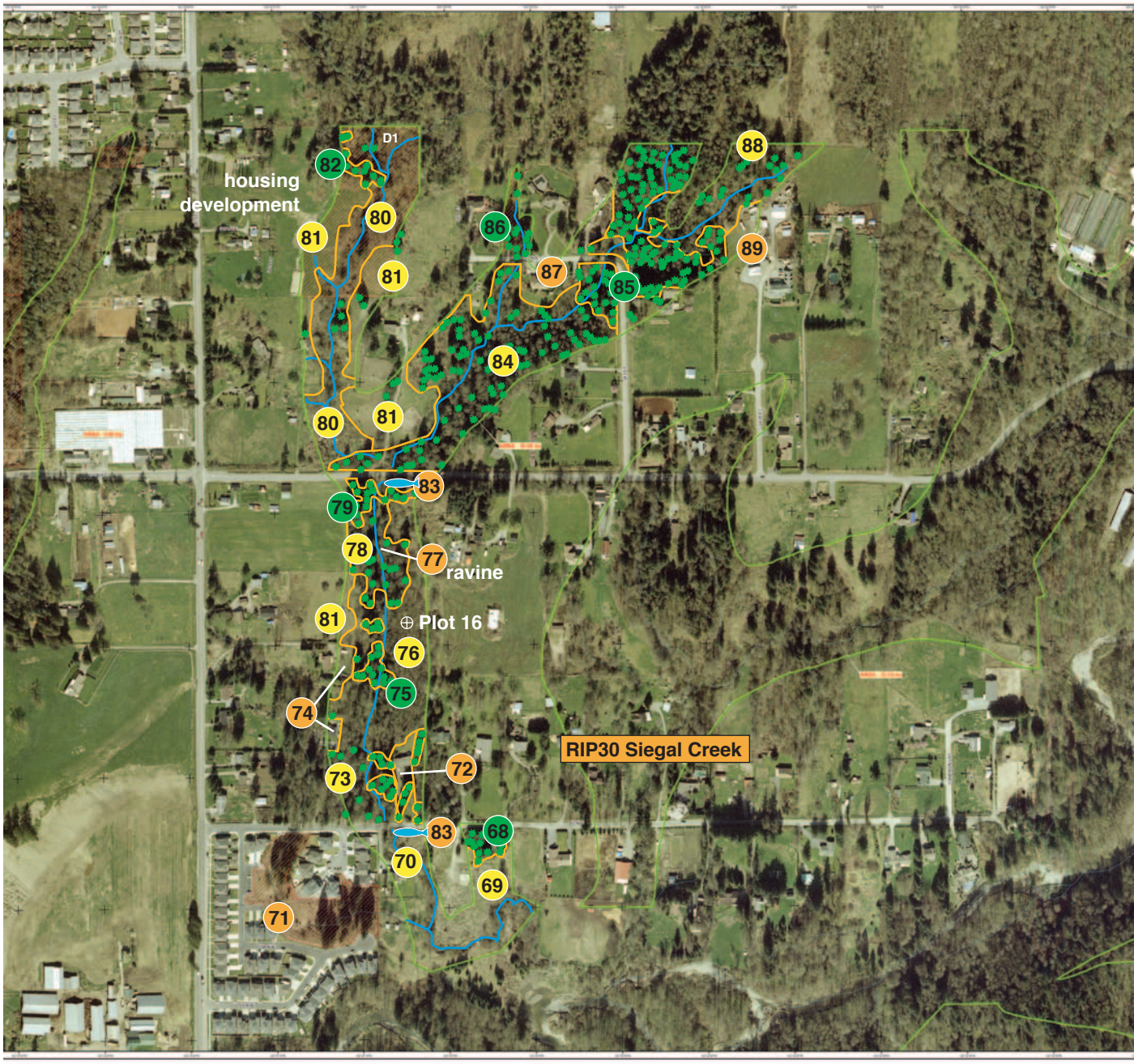
Conservation Areas

Municipal Land and Leases

Contour Lines

Riparian Polygon 32


66
67
D1D2
65
64
Plot 12
63
62
D1D2
Plot 13
Plot 14
61
D2
60
D2
59
RIP31
57
58
56
D1D2
55
trail
treatment
no treatment
feature of interest
fish released/observed/sampled
D1D2 dying-1 and dead-2 alder
15 m
N
Legend
Conservation Areas
Municipal Land and Leases
Contour Lines
Riparian Polygon 31
Kanaka Greenbelts
CORPORATION OF THE DISTRICT OF MAPLE RIDGE

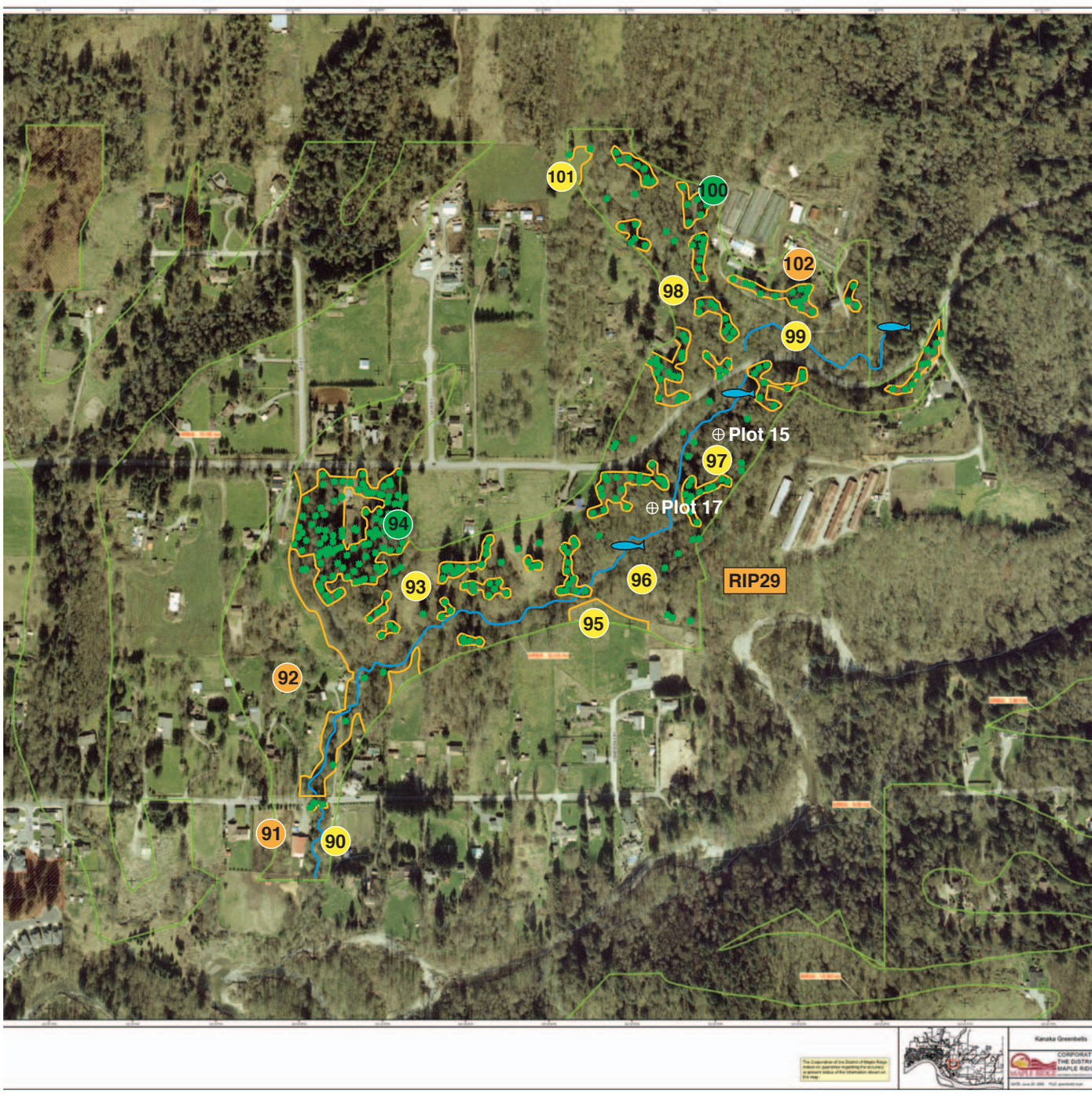


rvation Areas
pal Land and Leases
ur Lines

15 m

- treatment
- no treatment
- feature of interest
- fish released/observed/sampled
- D1D2 dying-1 and dead-2 alder

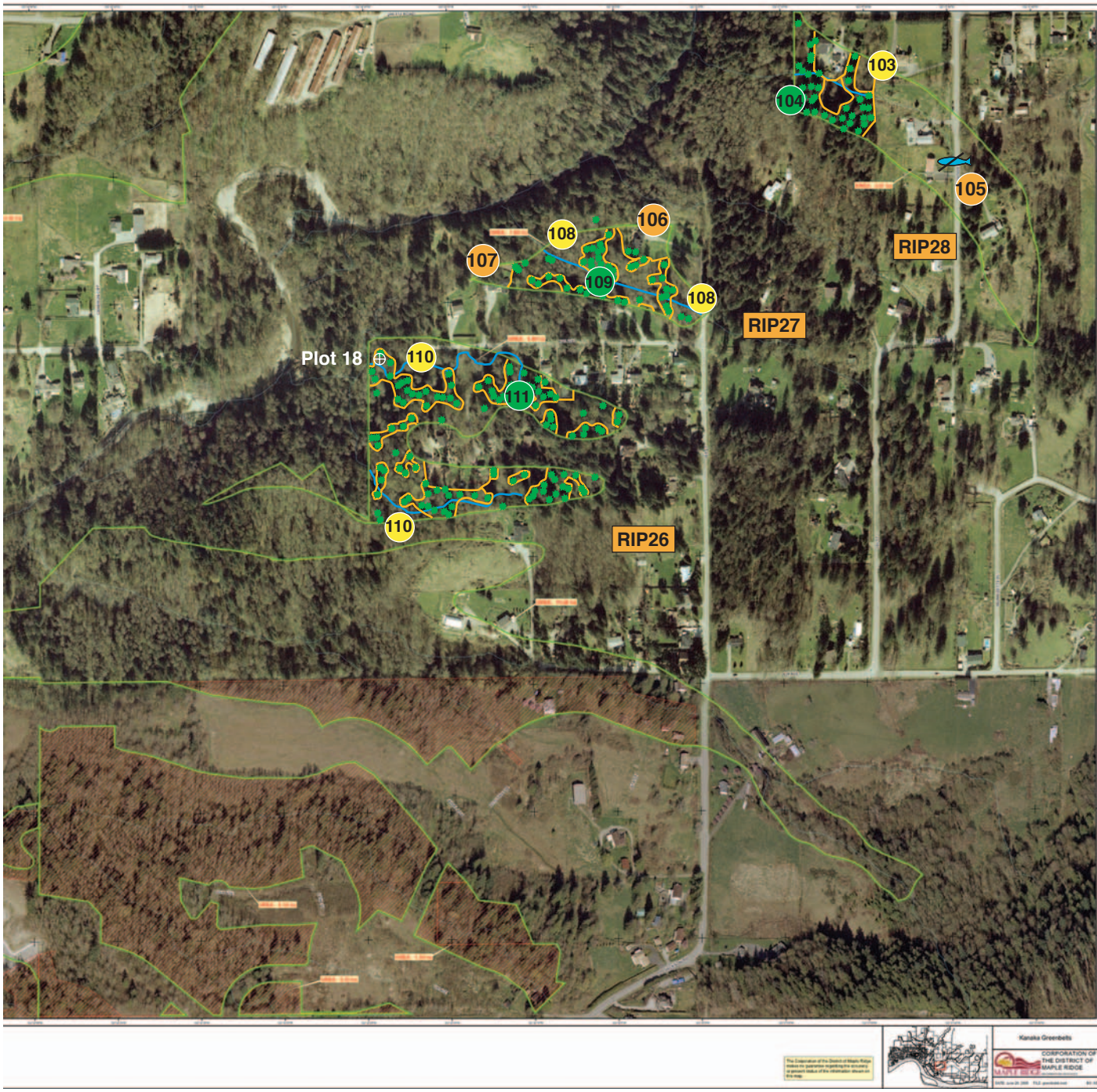
Riparian Polygon 30 (Siegal Creek)



15 m

- treatment
- no treatment
- feature of interest
- fish released/observed/sampled
- D1D2 dying-1 and dead-2 alder

Riparian Polygon 29 (Dunlop Creek)



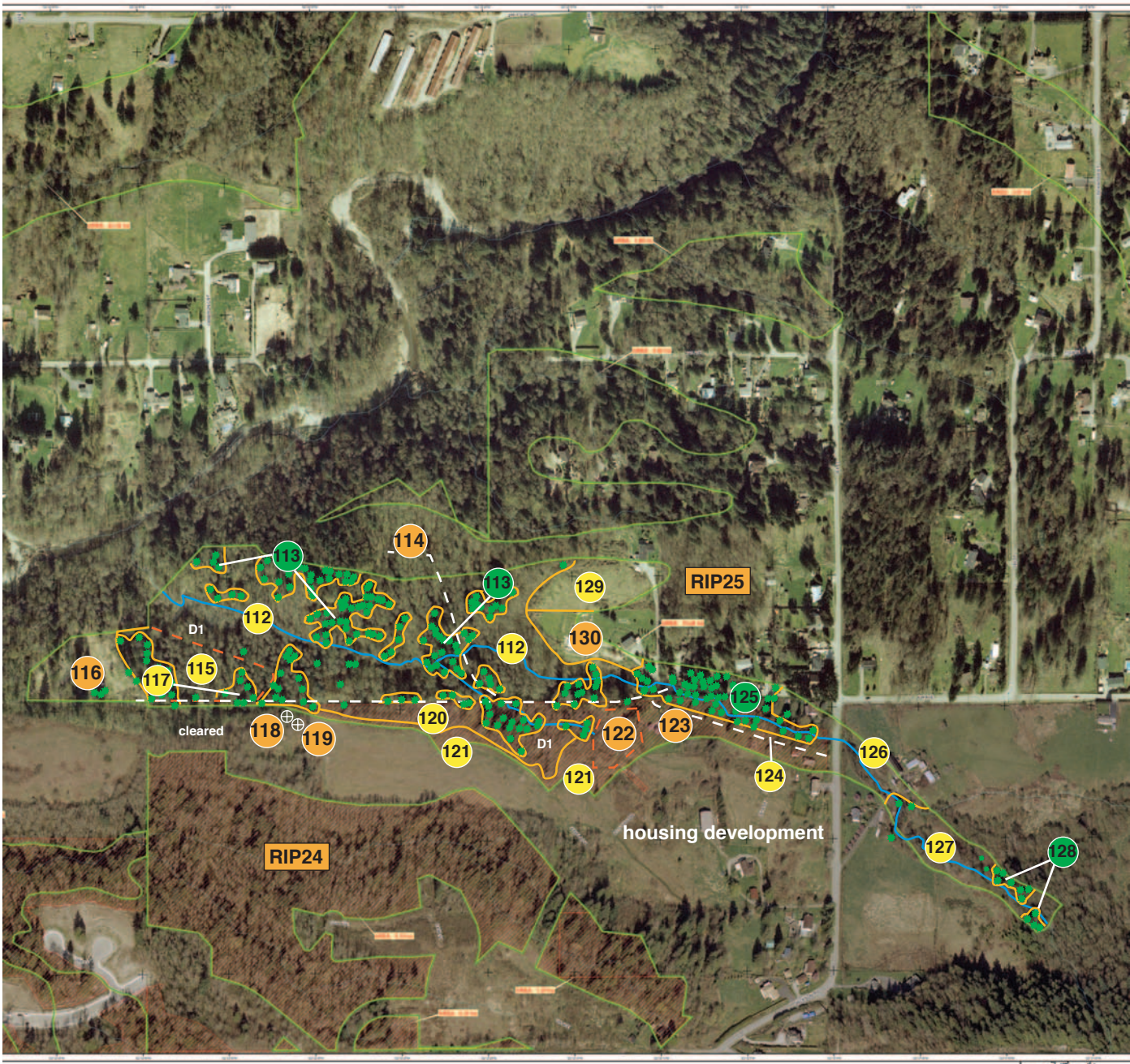
15 m

- treatment
- no treatment
- feature of interest
- fish released/observed/sampled
- D1D2 dying-1 and dead-2 alder

Riparian Polygons 28, 27, 26

ERA

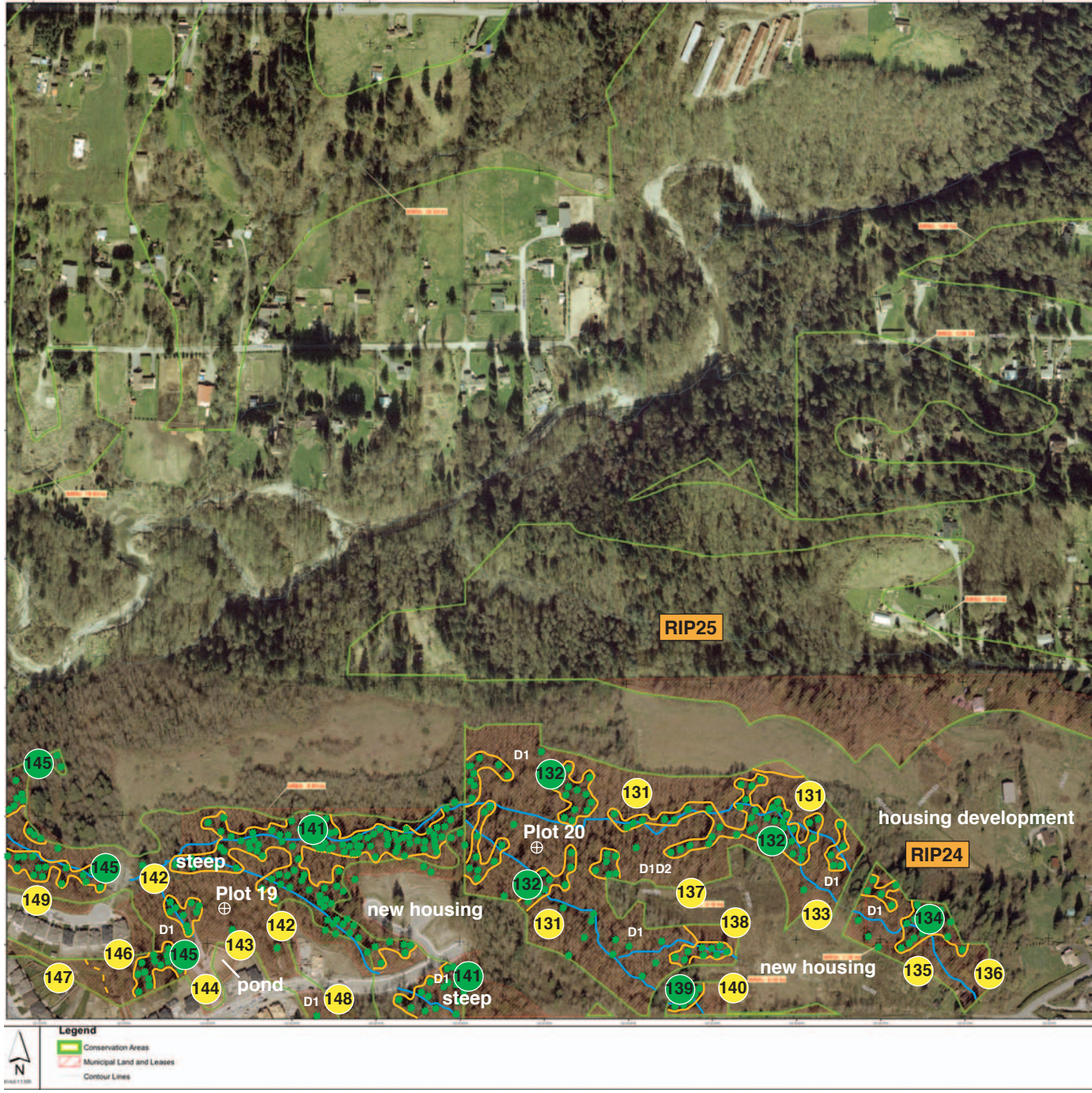
Poulin



15 m

- treatment
- no treatment
- feature of interest
- fish released/observed/sampled
- D1D2 dying-1 and dead-2 alder

Riparian Polygon 25



Legend
Conservation Areas
Municipal Land and Leases
Contour Lines

N

15 m

- treatment
- no treatment
- feature of interest
- fish released/observed/sampled
- D1D2 dying-1 and dead-2 alder

Riparian Polygon 24