

What We Found

What We See

C-3 STREAM SYSTEMS AND STREAM HABITAT

C-3.1 Watershed Character

Streams are, of course, part of a larger system - namely, the watershed. Since a stream is only as healthy as the watershed where it's located, we cannot begin to work towards a solution without first looking at the whole watershed to determine what may be contributing to the problems. Our study area encompasses six drainage basins: Gibsons, Charman, and Chaster Creeks are the major drainage basins, with Goosebird, Secret, as well as two small ephemeral streams being less significant. The Town of Gibsons is bounded by Gibsons and Chapman Creeks leaving them less impacted by urbanization than Charman and Goosebird.

The quality of a stream system relies on the interaction between many physical and biophysical factors. Physical attributes of a watershed such as land uses, storm water and flood control systems, natural areas and land management practices on stream channels all alter the streams natural dynamic equilibrium. Biophysical attributes such as land forms, geology, soils, and climate influence the character of the stream. By looking at both of these factors we can begin to evaluate the impact that urbanization is having on our watersheds.

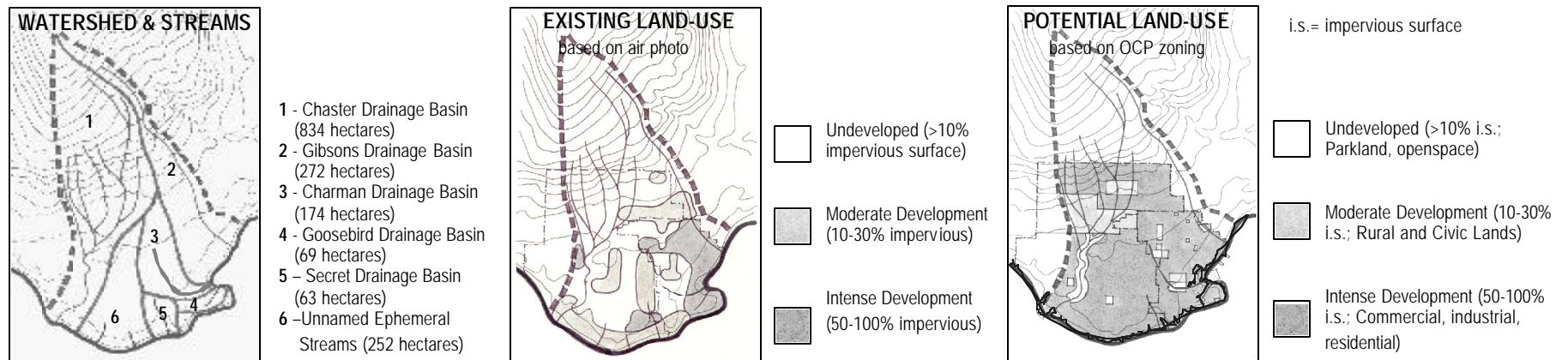
One way to determine the health of an urban watershed is to look at its degree of imperviousness. Traditional urban development leads to an increase in imperviousness translating into a corresponding decrease in infiltration. As a result, the streams receive increased peak flows as well as non point-source pollutants, thereby directly affecting the health of the riparian habitat.

The amount of imperviousness in an urban area varies according to different land-uses. Urban development has, on average, over 54% of its land area covered by impervious surfaces.¹ In Gibsons' case, the total area of the study watershed is 1664 hectares, of which approximately 12 % has been urbanized and as currently zoned, future development could cover over 50% of the land area.

We need to recognize that because our watershed includes three electoral areas with very arbitrary boundaries, development occurring in north Elphinstone will impact streams within the Town of Gibsons.

Who owns the stream? Before 1910, parcels of land were issued through the Crown Land Grant that included the streambed. Only until very recently, does newly developed land require a 15-meter setback on either side of the stream.

Based on current growth strategies, 25% of the total area of the watershed could potentially be hardened in the future. Knowing that a stream starts to be degraded when its watershed has 10% impervious cover, what implications does this have for the future health of the streams?



What We Found

Stream hydrology and vegetation directly impact the nature of the habitat that streams provide for a range of aquatic species. Fish habitat is influenced by a number of variables such as food, substrate, water quality, water quantity, access, gradient and cover.

Hydrology: The creeks within this watershed are small and steep as they come down mountainsides. They then flatten out for a short distance before reaching the ocean. For most of their length, these streams are contained within deep ravines which have developed as a result of the gradient and easily eroded glacial soils. Flooding typically acts as a control mechanism for streams, as it dissipates velocities. However, due to the constricted nature of these streams this cannot occur. When the high flows hit the low gradient floodplain, there is naturally a concern about flooding and debris flows. High velocities lead to erosion, scouring and eventually sedimentation. Suspended sediment degrades the water quality of the stream as it clogs and abrades fish gills. Sediment deposition results in the loss of productive habitat areas for the following reasons: it smothers eggs and kills salmonid alevin; infills pools and riffles, reducing the availability of rearing habitat and it causes food shortages by smothering or displacing aquatic organisms. The stream flow regime in the Gibsons area tends to be quite high during the winter events, drying to almost a trickle during the summer months. High velocities make it difficult for fish to find places of refuge, however low flows often mean higher water temperatures which fish can not withstand.

Vegetation: Riparian vegetation is critical for supporting life in the water in the following ways: 1) vegetation shades and cools water temperatures 2) its roots assist in bank stability for erosion control 3) it contributes food sources from insects dropping into the water 4) supplies large woody and small organic debris which is primary source of organic energy in stream ecosystems 5) vegetation acts as a filter by trapping sediment introduced by surface run-off before it reaches the stream 6) it stores a great deal of moisture minimizing the amount of runoff a watershed experiences.

Traditional urbanization changes the natural stream structure in many ways. (See graphic)

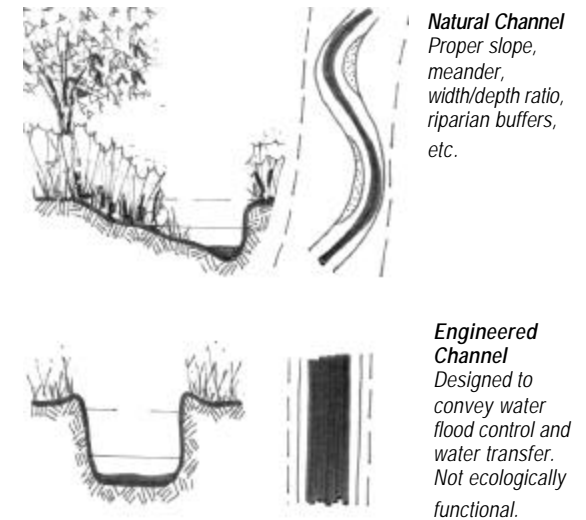
Physical modifications of the urban watershed include:

- The removal of native vegetation and wildlife habitat, exposes the stream channel to more sunlight. This results in higher water temperatures as well as growth of unwanted reeds and algae that can choke the channel causing stagnate water and anaerobic conditions;
- A loss of connections among landscape features such as tributaries from main channels and channels from floodplains;
- A change in watershed hydrology due to:
- hardening of the landscape - flows become flashier, total runoff is increased, dry season base flows are reduced, and channels become unstable.
- culverted stream channels - riparian zones are eliminated or separated from the stream channels resulting in loss of nutrients to the aquatic organisms, loss of shade, increased bank erosion, lateral movement of stream channel, increased sedimentation, and decreased pool depths.
- floodplains become separated from stream channels because the channels have become incised or deepened or the previous land-use practices have added large layers of fill to floodplains.

What We See

The climate and soils conditions of the area already tend to be poor for providing the opportunity for infiltration, particularly in the winter months. Even if a new development was designed to minimize its imperviousness it might not significantly reduce the amount of runoff due unless a large amount of vegetation has been retained.

Although there is concern for flooding in Gibsons, there has been no record of it ever occurring.



Natural Channel vs. Engineered Channel

C-3.3 Stream Summaries

Chaster Creek ⁱⁱ⁻ (Gower Creek)

Aquatic Species: Major spawning location for steelhead and cutthroat trout, chum and coho salmon in the bottom 2 km of stream. The stream has been stocked by the Grantham's Salmonid Association and DFO with chum fry since 1981 and coho smelts since 1992.

Landuse/Character: The upper 1.5km of the creek runs through a rural residential area and has good vegetative cover. The lower portion is semi-altered to very altered with flood potential due to development pressure.

Issues: Is subject to heavy rains and extensive erosion, scouring and heavy siltation.

The culvert under Highway 101 is impassible to fish.

The middle section of the stream faces erosion problems due to drainage systems of the adjacent developed areas leading into the stream (King Road ditch system).

Observations: The lower section of the creek tends to flood regularly and is affected by urbanization since some of the houses were built directly on the floodplain.

Any further development in the vicinity of the creek should be well considered and if found desirable environmentally-sensitive techniques should be applied - tall concrete walls as bank protection are not the answer!

Charman Creek ⁱⁱⁱ⁻

Aquatic Species: cutthroat trout, coho and chum salmon

Land Use/Character: Residential, industrial, and commercial. Charman Creek is very urbanized and is the natural drainage channel for a large portion of Gibsons.

Issues: The existing culverting of lower Charman Creek is undersized and has implications for flooding.

Potential fish habitat values between the Town Park pond and Inglis Road are very low, due to the scarcity of pools, lack of cover, and the low water flows during the summer.

Observations: In the Gibsons urbanized area the conditions vary greatly within meters, going from well-shaded areas with mainly secondary growth of riparian vegetation and natural streambed to channeled parts without vegetation cover.

This creek has potential to serve as an interactive element for the citizens of Gibsons as well as for tourists. It flows through the hearth of the community, providing an opportunity for recreation, stream revitalization, education, and other possible activities to be promoted. Part of this potential has been recognized by DFO since they have installed an information board explaining the life cycle of salmon. Sheane Reid, the DFO Community Advisor, would like to see a better presentation of the stream habitat value and more interesting (ideally interactive) forms of delivering this information to the public.

According to the official Provincial Gazette, the three smaller streams (Secret, Charman and Goosebird) do not have official names. As a result, no official mapping of these streams has been done.

The studies that have been done on the larger streams are extremely difficult for the general public to access. (For example, a Habitat Assessment for Chaster Creek was done but is an unpublished government report!)

Unlike Gibsons Creek, Charman Creek has been heavily impacted by urbanization and is no longer a stable stream system. However, its demise is in some ways an opportunity for providing community access and awareness of the watershed.

For being such a small creek, Charman Creek drains an enormous area.

What We Found

Gibsons Creek –

Aquatic Species: Fish observed spawning: chum, rainbow trout, cutthroat, coho salmon, and steelhead.

Land Use/Character: The creek is largely undeveloped and provides passive recreation to the communities at various locations with park uses such as picnics, hiking, sitting, etc.

Issues: No fish found in upper Gibsons Creek above Highway 101.

Due to development, the upper part of its watershed has expanded and therefore accommodates twice the amount of runoff as it did pre-development.

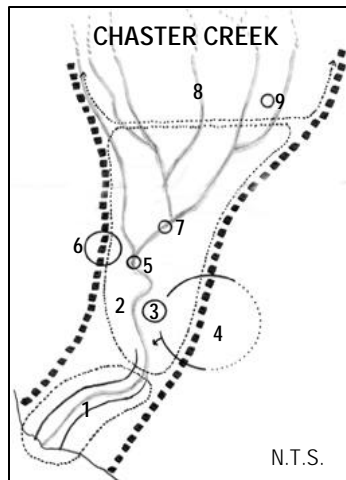
The creek channel and riparian vegetation of upper Gibsons Creek, within the private properties immediately south of Reed Road, have been significantly disturbed as a result of clearing activities by the property owners. However, through a review of the undisturbed areas there is low to negligible aquatic habitat values in the upper Gibsons Creek.

Observations: This is the best preserved stream in the area. Its natural status is kept due mainly to the topographic configuration of the watershed (it is easiest to develop on the flatter downstream areas and as a result there has been minimal development within this watershed).

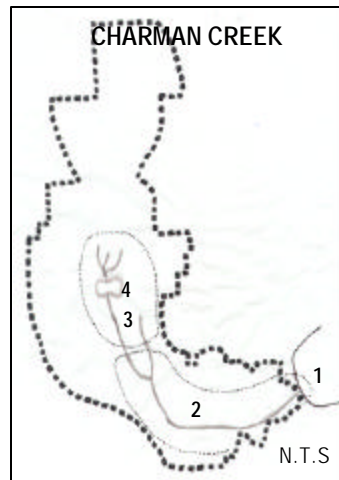
A high number of exotic species were observed in the lower section. This could potentially be a problem as it is very difficult to eliminate the occurrence of invasive species growing close to the stream where use of any herbicides is difficult.

What We See

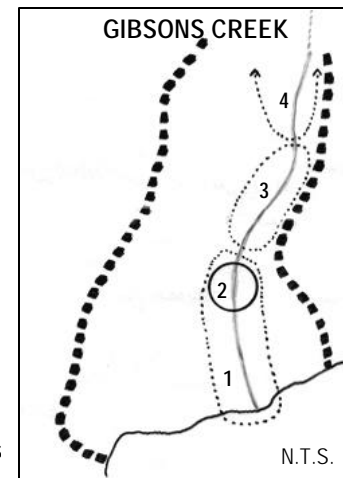
Sensitive Habitat Inventory (SHIM) has only been done for Chaster Creek, however, it has not been synthesized and no conclusions have been drawn.



- 1 – Flood potential due to development pressure
- 2 – Semi-altered state
- 3 – Sand and gravel pit
- 4 – Drainage results in high velocities and bank erosion
- 5 – Landslide changed stream path
- 6 –Trailer Park
- 7 –Impassible Culvert
- 8 –Preserved in semi-natural state
- 9 – Well; Increased groundwater extraction



- 1 – Mouth
- 2 – Lack of cover, scarcity of pools, extremely low flows in summer
- 3 – Fish presence unlikely above Inglis Road; Low flows
- 4 – Retention Pond



- 1 – Culverted; with exotic species
- 2 – Riparian vegetation and stream bed have been disturbed by residential development
- 3 – No fish have been found above Hwy 101
- 4 – Preserved in semi-natural state

What We Found

There are many benefits from stream stewardship that can improve the quality of urban life. The waters of Gibsons' creeks produce fish; their vegetation has important values for aesthetics, shade, and wildlife habitat; they inspire trails and parks; and they can enhance the values of commercial and downtown areas. Below is a list of some environmentally sensitive design principles for preserving and enhancing the urban streams in Gibsons and its hinterlands.

- Provide and protect leave areas (riparian buffers) near streams
- Use environmentally sensitive flood, erosion, and channel-instability solutions
- Retrofit storm drain outfalls by marking those emptying into streams
- Prevent discharge of deleterious substances to streams
- Retrofit or replace culverts to ensure fish passage
- Create stable stream channel geometry
- Create trails and greenways along riparian corridors
- Improve the water quality, water supply, and habitat for stream life
- Encourage voluntary stewardship of private lands
- Enhance the neighborhood and re-create a sense of community

Urbanization is affecting the watershed of Gibsons with catastrophic effects. Urban development has removed protective riparian vegetation and increased impervious cover, which in turn has increased surface runoff and sedimentation with deleterious effects to the stream systems and fish habitat. By restoring the disturbed areas and using environmentally sensitive design principles for those areas yet to be developed we can improve and preserve the health of the Gibson urban watershed.



Charman's stream character changes dramatically within meters of each other from exposed engineered channel to one taken over by exotic vegetation



Bridges can be an appropriate design alternative in certain areas. Note the low water flow in culvert. It's doubtful fish can survive in this.



Community education is key in any restoration project.

Notes:

¹ Arnold and Gibbons, "Impervious Surface Coverage."
² Fisheries and Oceans, "Fisheries Information Summary System (FISS)."
³ Urban Systems, Charman Creek Master Drainage Plan, 1998.

What We See

As Gibson's population increases, so does its need for water. Increased water extraction coupled with the hardening of the watershed, will drastically decrease groundwater recharge and as a result, reduce the stream's base flow, impacting habitat areas. As far as we know, the Ministry of Environment has not set a minimum flow for the creeks in this area. Consequently, water could conceivably continue to be taken from the system until the creeks run dry!