

# Invasive Species and Climate Change Adaptation in BC

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Columbia River Basin Meeting

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# Outline

- Overarching structure of invasive species management in BC
- Inter-Ministry Invasives Species Working Group
- Responding to a changing climate
  - Fires and floods
  - Predictive species habitat range modelling
- Managing invasive species moving forward
- Resources and Reporting Tools



# British Columbia: Diverse in natural landscape and cultures



# Inter-Ministry Invasive Species Working Group

## PURPOSE:

To ensure coordinated, collaborative and cost-effective delivery of the provincial government's invasive species programs, through science-based:

- strategic planning,
- harmonized and robust legislation,
- acquisition of resources, and
- consistent reporting practices.

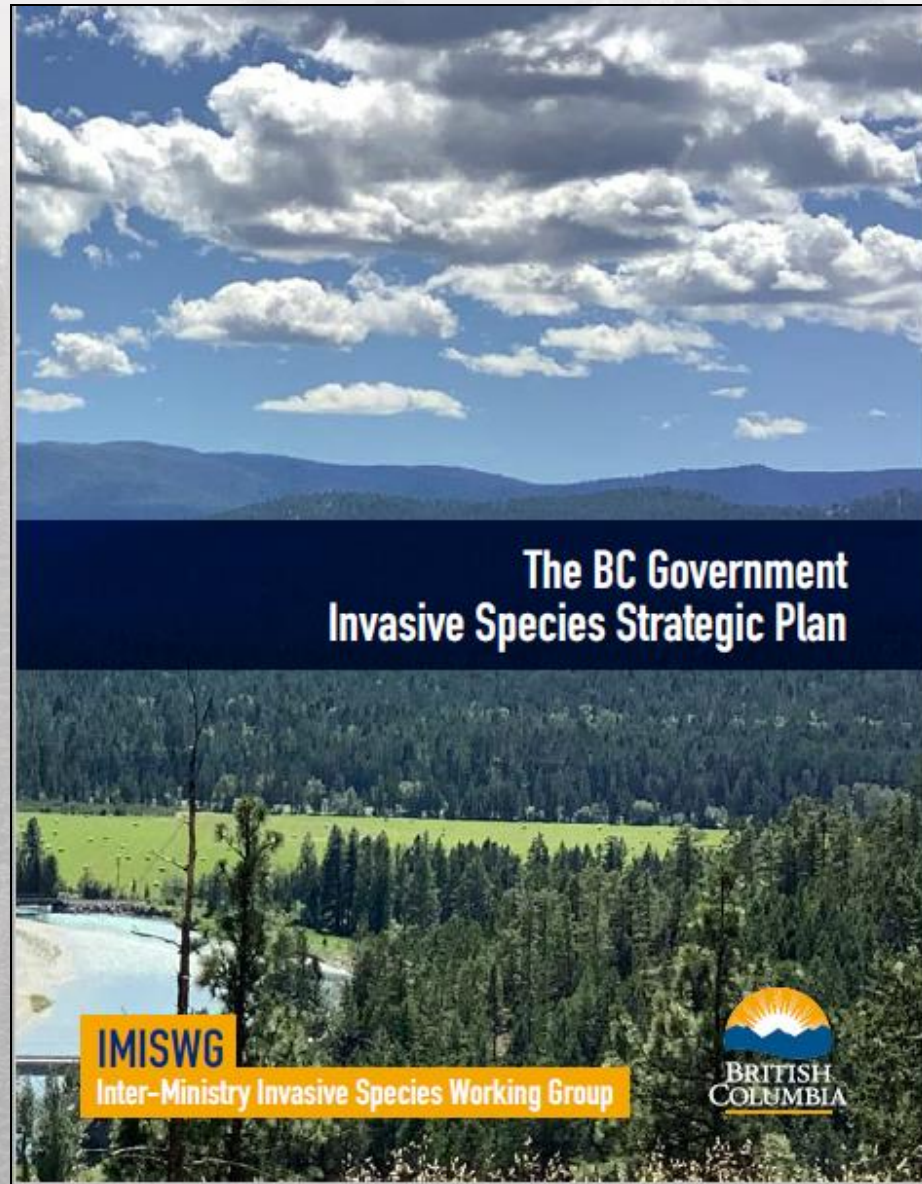
BC INTER-MINISTRY INVASIVE SPECIES WORKING GROUP

*imiwg*

PROTECTING BC'S RESOURCES



# Invasive Species Strategic Plan



- Increased acknowledgement of responsibilities of reconciliation and shared land management with Indigenous communities
- Inclusion of climate change projections in decision making
- Recovery/restoration post fire, flood and other disturbances
- Modernization of language, tools and technology

# Climate Change and Invasive Species

## *3 main linkages:*

1. Changes in potential range extent/  
suitable habitat may shift the risk of species
2. Increases in frequency and severity of large  
scale disturbances (e.g. Wildfires and Floods)
  - Including the response to these events
3. Reduction in ecosystem resiliency – strain on  
native species then less able to withstand  
invasion from non-native species



# Predictive Habitat Modelling – supporting better management decisions

- Invasive species predictive climate modeling
- Models species range in BC based on 10+ climate variables for current, 2011-2040, 2041-2070, and 2071-2100
- Future potential range incorporated into all risk assessments and species prioritization decision making

COMPLETED TO DATE	
Invasive Plants	Invasive Animals
Black Henbane	Oriental weather loach
European Common Reed	Quagga Mussels
Yellow Floating Heart	Rosy Red Minnow/Fathead minnow
Cheatgrass	Zebra Mussels
Common Tansy	Eastern Newt
Eggleaf Spurge	Feral Pig
Flowering Rush	Nutria
Garlic Mustard	Spongy Moth
Giant Hogweed	Japanese Beetle
Marsh Plume Thistle	Spotted Lantern Fly
Perennial Pepperweed	
Poison Hemlock	
Shiny Geranium	
Spurge Flax	
Water Hyacinth	
Wild Chervil	

# Invasive Species Range Predictive Climate Modeling

## Suitability Analysis Workflow

- **Approach**

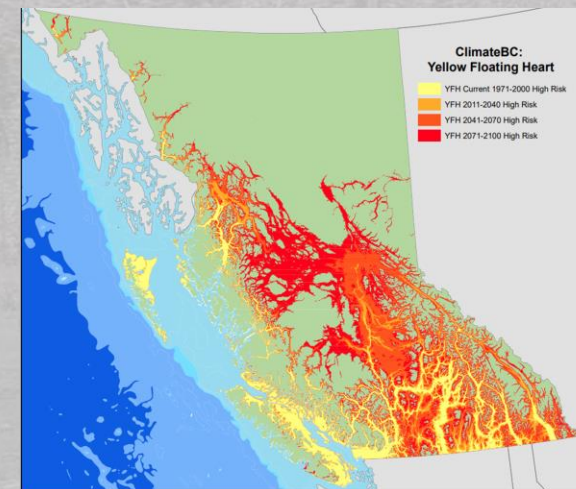
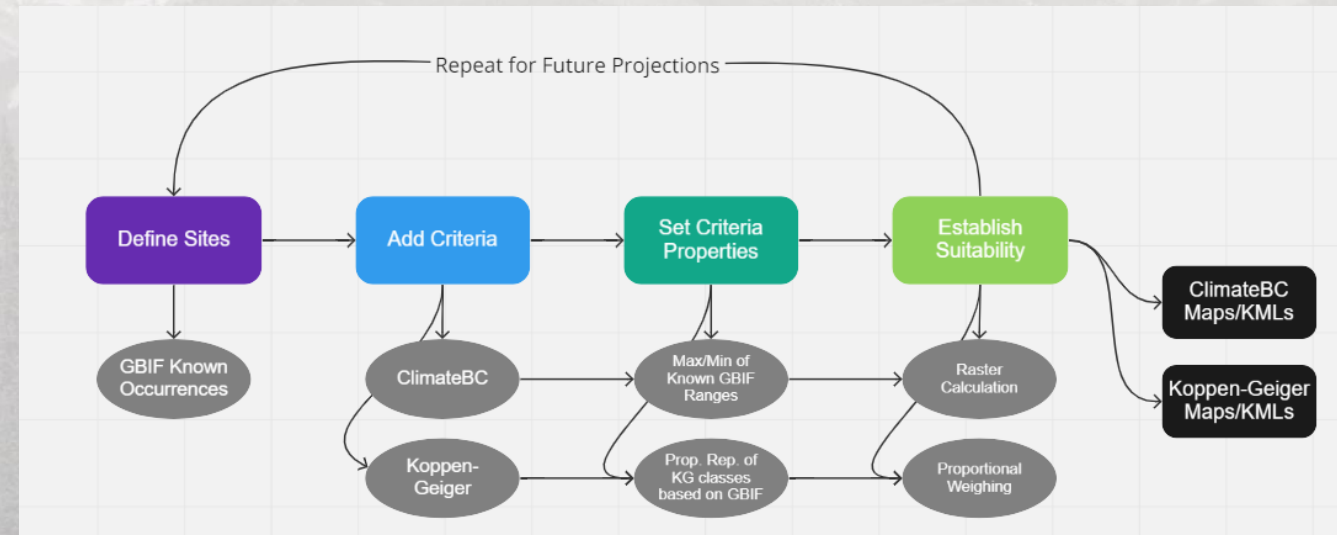
- Explored two methods for Tier One: Climate BC and Koppen-Geiger

- **Purpose**

- Accurately map species current potential ranges, and to project into future

- **Rationale**

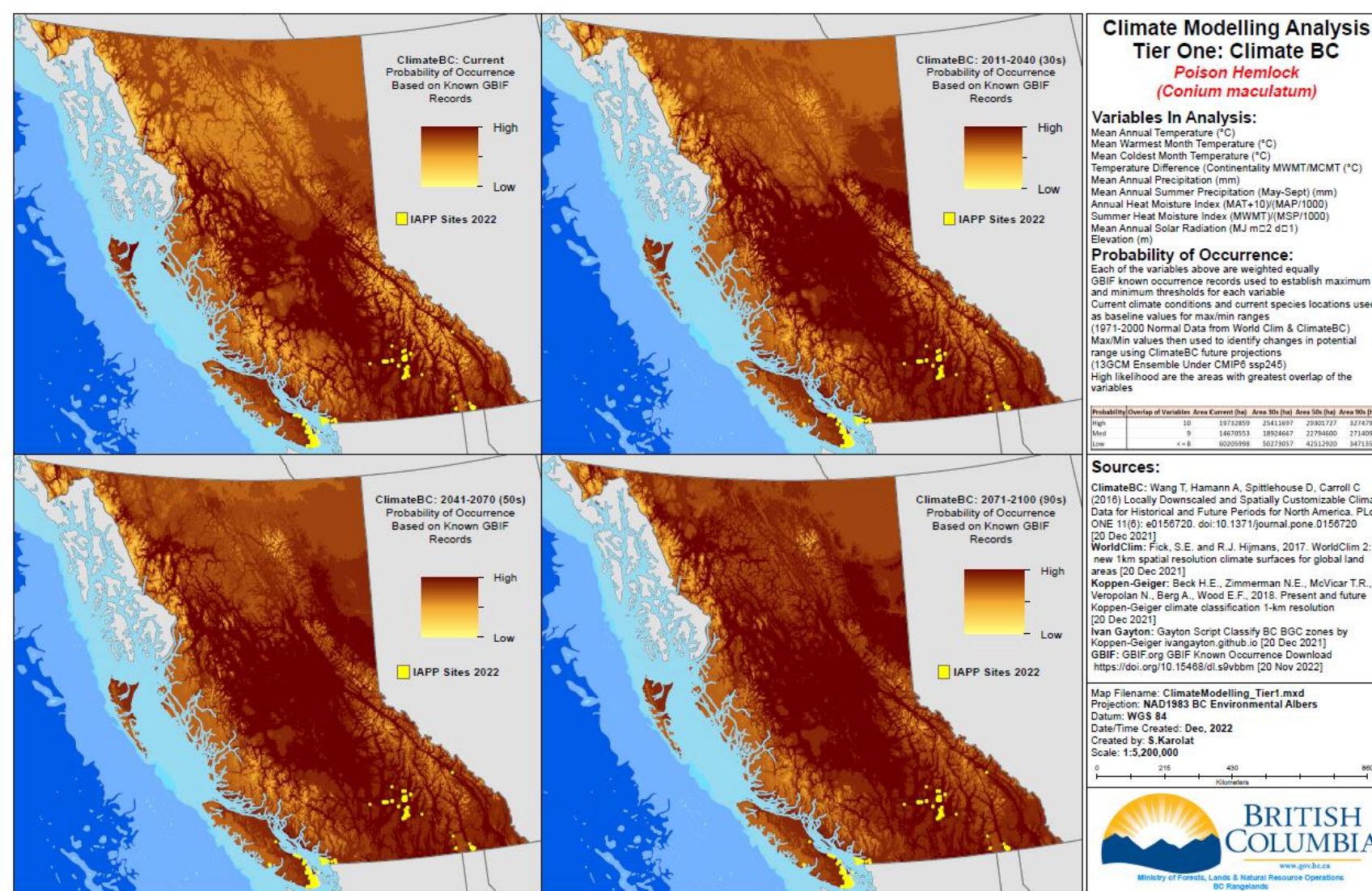
- With the climate changing current climate data will not suffice for anticipating potential ranges for invasive species in BC



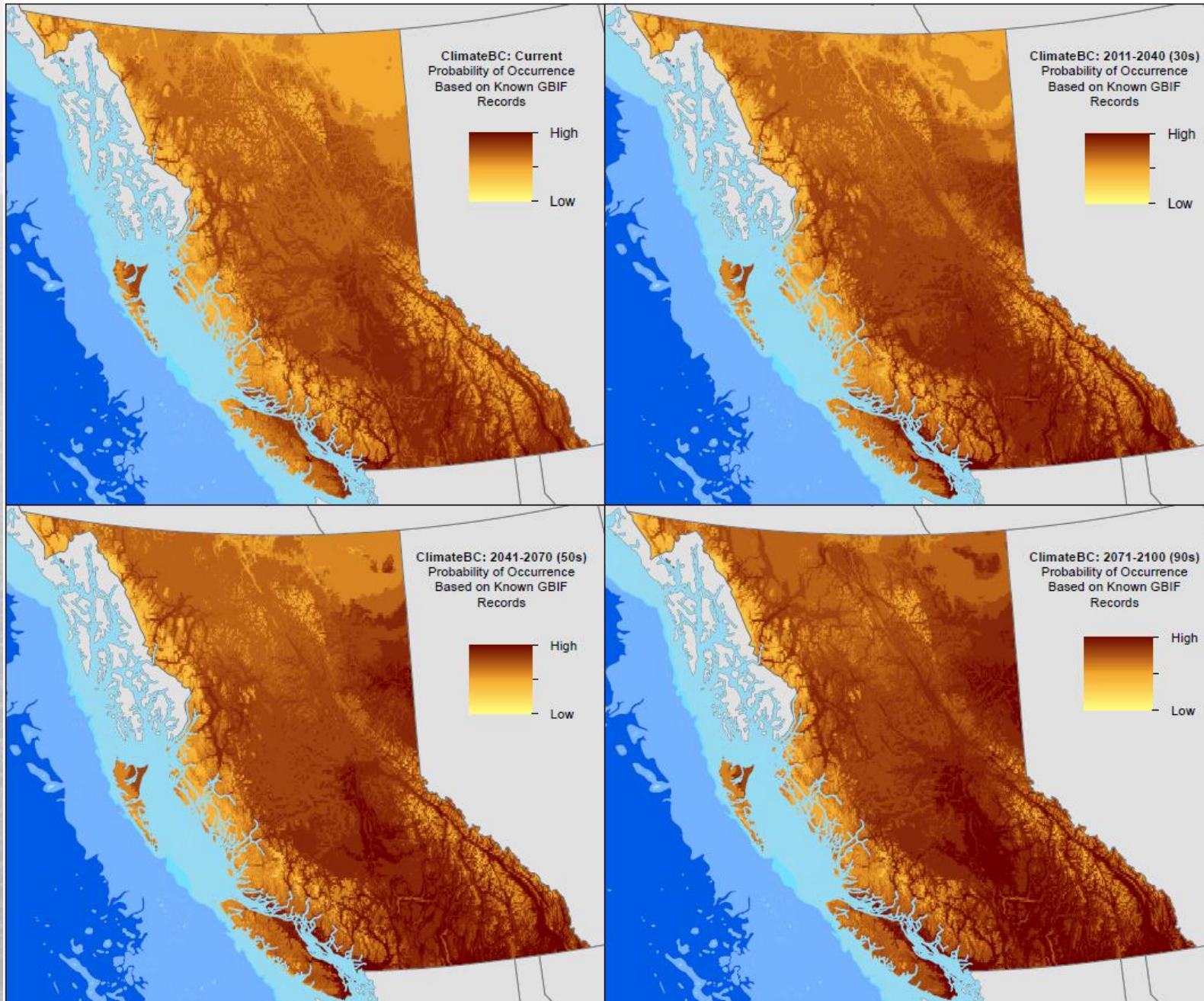


# Climate Change Adaptation and Predictive Mapping

## Poison Hemlock



# Spotted Lantern Fly



## Climate Modelling Analysis Tier One: Climate BC *Spotted Lantern Fly* *(Lycorma delicatula)*

- Variables In Analysis:**
- Mean Annual Temperature (°C)
  - Mean Warmest Month Temperature (°C)
  - Mean Coldest Month Temperature (°C)
  - Temperature Difference (Continental MWT/MCMT (°C))
  - Mean Annual Precipitation (mm)
  - Mean Annual Summer Precipitation (May-Sept) (mm)
  - Annual Heat Moisture Index (MAT+10)/(MAP/1000)
  - Summer Heat Moisture Index (MWT)/(MSP/1000)
  - Mean Annual Solar Radiation (MJ m<sup>2</sup> d<sup>-1</sup>)

**Probability of Occurrence:**  
Each of the variables above are weighted equally GBIF known occurrence records used to establish maximum and minimum thresholds for each variable Current climate conditions and current species locations used as baseline values for max/min ranges (1971-2000 Normal Data from World Clim & ClimateBC) Max/Min values then used to identify changes in potential range using ClimateBC future projections (13GCM Ensemble Under CMIP6 ssp245) High likelihood are the areas with greatest overlap of the variables

Probability	Overlap of Variables:	Area Current (ha)	Area 30s (ha)	Area 50s (ha)	Area 90s (ha)
High	10	696080	3286447	7388258	12770123
Med	8 & 9	32431248	8822104	4860851	48126982
Low	< 7	61482426	52497928	43612665	33704135

**Sources:**

**ClimateBC:** Wang T, Hamann A, Spittlehouse D, Carroll C (2016) Locally Downscaled and Spatially Customizable Climate Data for Historical and Future Periods for North America. PLoS ONE 11(8): e0150720. doi:10.1371/journal.pone.0150720 [20 Dec 2021]

**WorldClim:** Fick, S.E. and R.J. Hijmans, 2017. WorldClim 2: new 1 km spatial resolution climate surfaces for global land areas [20 Dec 2021]

**Koppen-Geiger:** Beck H.E., Zimmerman N.E., McVicar T.R., Veropolan N., Berg A., Wood E.F., 2018. Present and future Koppen-Geiger climate classification 1-km resolution [20 Dec 2021]

**Ivan Gayton:** Gayton Script Classify BC BGC zones by Koppen-Geiger ivangayton.github.io [20 Dec 2021]

**GBIF:** GBIF.org GBIF Known Occurrence Download <https://doi.org/10.15468/dl.s9vbbm> [20 Dec 2021]

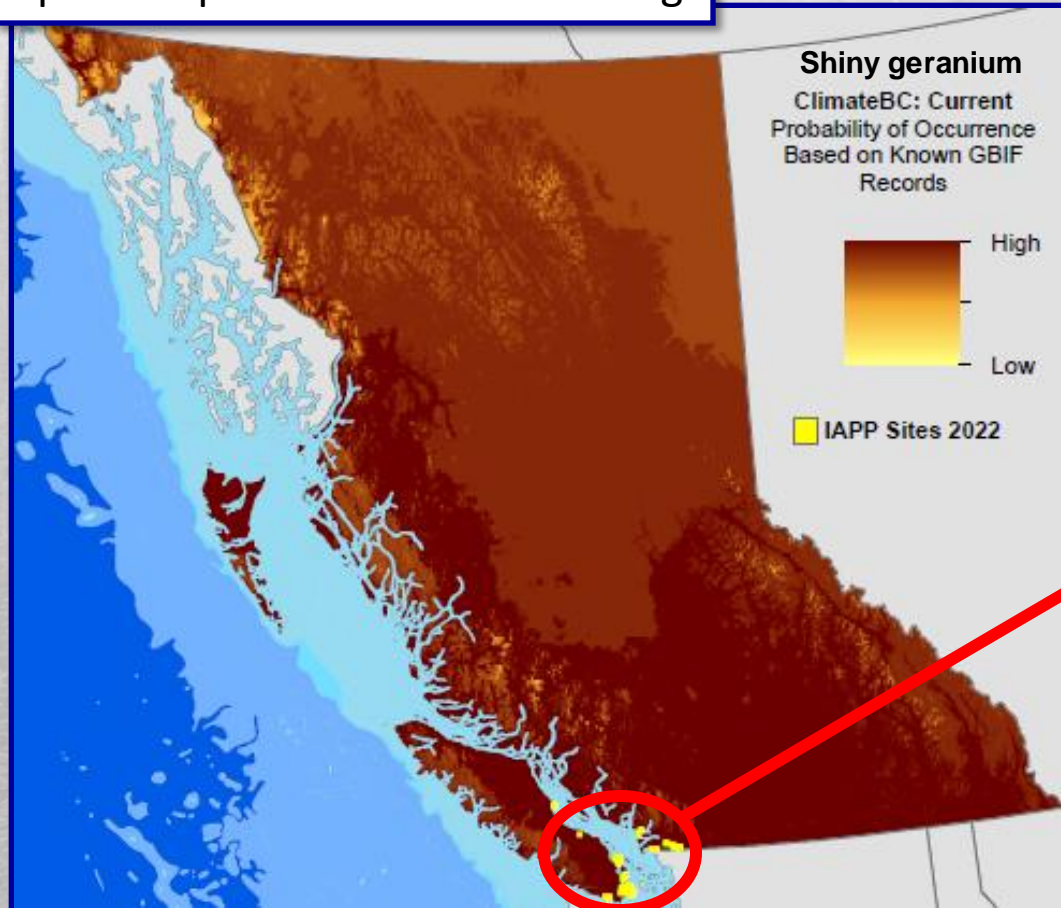
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Projection: NAD1983 BC Environmental Albers  
Datum: WGS 84  
Date/Time Created: Jan 27, 2022  
Created by: S.Karolat  
Scale: 1:5,200,000

# Next Steps

# INVASIVE SPECIES

## SITE TYPE MODELING FOR TARGETED SURVEILLANCE

Species-Specific Climate Modeling



Habitat Modeling  
will further increase range map accuracy

High-Risk Site Type Modeling



# Managing Invasive Species Moving Forward

- Continued integration of climate change predictive mapping into Provincial risk assessments
- Using range extension mapping to help predict and manage for priority invasive species
- Elevating the need to protect and build resilient ecosystems better able to withstand climate change related events (floods, fires) and changes in species composition
- Working with Indigenous communities to integrate traditional knowledge and understanding potential impacts to culturally important species
- Training and support for the large increase in government staff related to wildfire risk reduction and recovery etc.

# IMISWG Website & Resources

[Home](#) > [Environmental protection and sustainability](#) > [Plants, Animals & Ecosystems](#) > [Invasive species](#) >

- ▶ Priority invasive species
- ▼ [Inter-Ministry Invasive Species Working Group](#)
  - Infested Soil
- ▶ Invasive species management in B.C.
  - Early detection and rapid response (EDRR)
- ▶ Integrated Pest Management
- ▶ IAPP database
  - Reporting invasive species
  - Resources and publications

## B.C. Inter-Ministry Invasive Species Working Group

On this page:

- [Collaboration, innovation, and leadership](#)
- [IMISWG strategic approach](#)
- [IMISWG sub-committees](#)
- [Provincial strategies](#)

Since 2004, the Inter-Ministry Invasive Species Working Group (IMISWG) has provided policy direction, coordination and collaborative delivery of invasive species programs for the Province of B.C. The IMISWG brings together provincial ministries and agencies with invasive species management responsibilities to manage invasive species together through a cross-government approach.

### INVASIVE SPECIES ALERT!

#### FLOWERING RUSH

(*Butomus umbellatus*)

HAVE YOU SEEN THIS PLANT?

**DESCRIPTION**

- Native to temperate Eurasia.
- Perennial, aquatic macrophyte.
- Two plant forms: emerged and fully submerged. Submerged leaves limp and floating. Emerged form erect with solitary stem.
- May or may not produce flowers. Flowers grow in pink umbrella-like clusters of 20 to 50 flowers. Bloom from June to August.
- Twisting, erect leaf spike. Rectangular plant base.
- Leaf cross-section distinctly triangular.
- Typically grow in shallow waters but can survive in water as deep as 6 metres. Plant grows up to 1.5 metres tall.



Province of BC

**PRIMARY THREAT: impedes use of shallow waters for recreation, irrigation & industrial activities, and alters natural ecosystems.**

**SPREAD**

- Reproduces mainly by rhizome and bulbets (grow at root crown and base of flower umbel >5mm diameter), and also by seed.
- Local dispersal mainly by water, human recreation and improper garden waste disposal.
- Nursery sales are the main pathway for long distance spread.



Province of BC

For more information: <https://www2.gov.bc.ca/gov/content/environ/animals-ecosystems/invasive-species/plants>

**REPORT INVASIVE SPECIES**

### INVASIVE SPECIES ALERT!

#### GOLDFISH

(*Carassius auratus*)

**NATIVE RANGE**

Goldfish are native to eastern Asia, including parts of China, Hong Kong, Japan and the Republic of Korea.



Photo: Whistler Aquatics, Eugene, Oregon

**DESCRIPTION**

Goldfish...

- Have a deep-elongated body, with a large head
- and eyes, and a small mouth
- Have a long dorsal (back) fin, which is longer than the head
- Have large scales on body, but lack scales on head
- Can range in colour from gold to olive-green to white
- Are on average 15-20 cm long and weigh 100-300 grams when mature adults

**PRIMARY IMPACT:**  
Compete with and feed on native fish species.



Photo: U.S. Fish and Wildlife Service, US Fish and Wildlife Service, Eugene, Oregon

**WHY SHOULD WE CARE?**

Goldfish...

- Have been reported to compete with native fish species for food in areas where they have been introduced
- Have shown to prey on native fish species in areas where they have been introduced
- Can disturb sediment while feeding, which increases water turbidity and may harm aquatic plants

**BIOLOGY & SPREAD**

Goldfish are being intentionally released into B.C. waterbodies by pet owners and escaping from outdoor ponds and aquariums. This species is an effective invader for its abilities to readily reproduce, withstand temperature and oxygen level changes, and consume an omnivorous diet. Once introduced, they can establish in local ponds and streams, and rapidly spread to surrounding water bodies.

**HABITAT**

Preferred habitats of Goldfish include streams and pools, ditches, and ponds. They tend towards areas where there is submerged aquatic vegetation. Goldfish can tolerate a wide range of temperatures and oxygen levels, and are unaffected by ice cover.

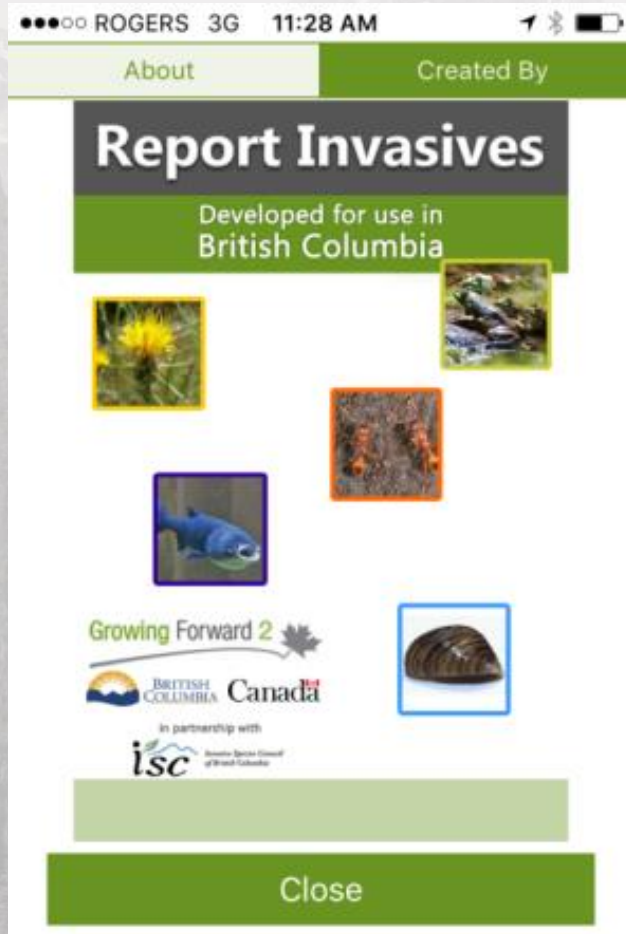
**REPORT INVASIVE SPECIES**  
[www.reportinvasives.ca](http://www.reportinvasives.ca)

**Did You Know?**

Goldfish are thought to be the first foreign fish species introduced to North America, dating back to the 17th century.



# Reporting Tools



- Smartphone Report Invasives App
- Over 2900 reports in 2022!
- Available to download from:

[www.gov.bc.ca/invasive-species](http://www.gov.bc.ca/invasive-species)

# Questions?

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