Weather Ready Landscapes

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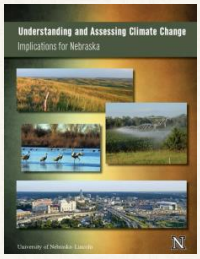
WEATHER VS. CLIMATE

- Weather is what you see out the window
  - Condition of atmosphere at given place and time
  - Sunny/cloudy; hot/cold; dry/wet
  - Time frame of hours or days – forecast
  - "Determines what we decide to wear that day"
- Climate is average or long-term state of atmosphere
  - Weather conditions expected for an area
  - Defined in terms of 30 year means
  - "Determines what type of clothes we have in our closet"

CLIMATE CHANGE REPORT FOR NEBRASKA

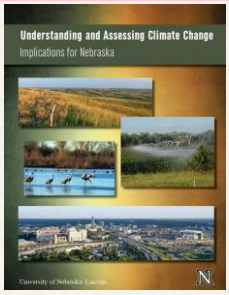
- Stakeholder identified issue
- Start the conversation
- Be aware of predictions
- Understand impacts
  - Implications
  - Horticultural implications
- Build resiliency
  - Community green space



http://snr.unl.edu/download/research/projects/climateimpacts/2014ClimateChange.pdf

PREDICTIONS FOR NEBRASKA

- Temperature
- Precipitation
- Drought
- Frost free season
- Implications for plants



OUR AVERAGE GROWING ENVIRONMENT

- Average frost free dates: East – April 30; West – May 21
- Average daily temperature range: 8.9°F to 89.5°F
- Average precipitation: East: 26" – 28"; West: 16 – 18"
- Hot summers, heat waves, drying winds
- Dry conditions mid-June through August
- Fluctuating winter temperatures (extremes)

COLD HARDINESS ZONES

- Update not due to climate change but better models, data collection technology, etc.
- Extremes still happen

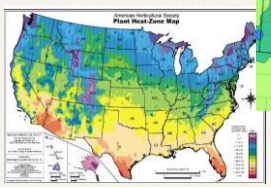
Images: usda.gov

1990
Blue: Zone 4a
Cream: Zone 5a

2012
Medium blue: Zone 5a
Turquois blue: Zone 5b

AHS HEAT ZONE MAP

- Developed in1997
- Average # of days per year above 86° F
- Point plants begin suffering physiological damage
  - Zone 6: 46 - 60 days
  - Zone 7: 61 – 90 days



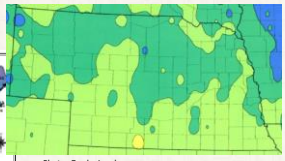


Photo: Gardeningplaces.com

N EXTENSION

WEATHER IMPACTS

- Landscape plant selection
- Placement of plant material
- Management requirements
- Produce more large variability jumps

N EXTENSION

WHY BUILD RESILIENT LANDSCAPES?

- Increased heat stress – summer 2012
- Increased drought stress –summer 2012
- Increased extreme events –Nov. 2014
- Longer growing season – increased water use and extended pest issues
- Hardiness zones change
- Increased rainwater runoff

N EXTENSION

BUILDING CLIMATE RESILIENCY

- Growth is promoted or limited by environment
- Any environmental factor less than ideal is limiting
  - Fertilization to increase nutrients will not make up for heat or drought stress
  - Increased watering does not make up for heat stress
- Most plant problems due to environmental stress
  - Directly or indirectly
- Right plant, right place
- Adapted plants; biodiversity
- Plant health management

N EXTENSION

BUILDING CLIMATE RESILIENCY

- React responsively to weather events
- Make corrective actions as needed
- Start assessing what can be done proactively
- Plan according to recommendations

N EXTENSION

Weather Ready Format

- Implication of Weather
- Climate Variability Trends
- Reactive Response
- Proactive Planning

N EXTENSION

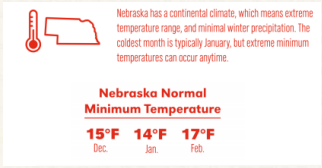
Weather Event Topics

- Winter Desiccation
- Ice
- Dormancy breaks
- Storms
- Drought
- Flood
- Hail
- Frost

WINTER DESICCATION

WINTER DESICCATION

- Winter desiccation occurs when the leaf and stem tissues lose more moisture faster than what the roots can absorb. These tissues are part of the permanent structure of a tree, shrub, perennial, or ground cover. It is often caused by extended periods of extreme winds and cold temperatures.



WINTER DESICCATION- Preventative Actions

- Identify desiccation prone plants in your landscape. Common specimens in Nebraska are arborvitae, spruce, white pine, euonymus, juniper, holly, yews and boxwood.
- Apply anti-desiccant products to plants with a history of damage. Read and follow label directions – usually 3 applications are recommended, spaced 6-7 weeks apart beginning in late fall ie. Thanksgiving, Christmas, Valentine's Day. Apply products to runoff when temperatures are above freezing.

WINTER DESICCATION- Preventative Actions

- Water soils around plants thoroughly in late fall and throughout the winter when temperatures are above 40 degrees. Use a soaker hose to apply water slowly and allow it to soak in before temperatures drop below freezing.
- Install burlap wind screens between the plants and the prevailing winds.

WINTER DESICCATION- Preventative Actions

- Remove or replace desiccation prone plant material
- Group plants with same water and light needs (Zone 4)
- Mulch under trees, shrubs and beds – proper depth
- Deep water plant material in fall – above 40 F
- Establish planting screens to reduce NW winds
- Promote dense turfgrass stands

WINTER DESICCATION- Corrective Actions

- Examine bark, buds, stems to determine if tissues are dried out
- Prune out desiccated and dried out portions of the tree/shrub

Images by Kelly Feehan

EXTENSION

WINTER DESICCATION- Corrective Actions

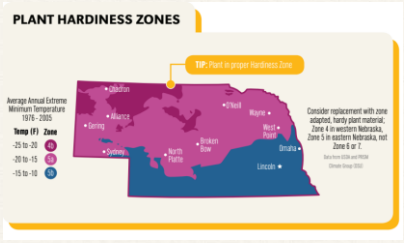
Images by Kelly Feehan

- Keep soil moist, not soggy or dry in spring, summer and fall following injury
- Avoid fertilization in first year after desiccation
- Mulch with wood chips to avoid weed competition and to moderate soil temperature and moisture
- Avoid placement of mulch next to the trunk to prevent suffocation and wildlife damage

EXTENSION

WINTER DESICCATION- Corrective Actions

- Consider replacement with zone adapted, hardy plant material



EXTENSION

ICE

EXTENSION

ICE

- Ice typically forms on surfaces when liquid precipitation falls on surfaces that have temperatures below 32°F. This requires warm air higher in the atmosphere to melt ice particles before falling to the freezing surface. The greater the thickness of ice and wind speed will increase the potential for damage.

EXTENSION

ICE- Preventative Actions

- Select and plant trees with dense wood and strong branch angles that are less susceptible to breakage. Consider slower growing trees over very fast growing trees
- Do not allow codominant trunks to develop on shade trees.
- Avoid staking trees too high on the trunk and for longer than one year. Staking material should be strong, but flexible to allow tree movement.
- Monitor trees for signs of decay: fungal growth on bark, discolored wood, large wounds

EXTENSION

ICE- Preventative Actions

- Prune trees correctly when young (from 3 to 4 years after planting up to 10 to 15 years of age) so tree develops a strong branching pattern.
- Follow recommended pruning practices. Avoid topping, rounding off, or pollard pruning on trees as these result in weakly attached sucker branches.
- Remove any dead, damage or diseased tree branches as you see them at the branch collar. Do not leave stubs.

N EXTENSION

ICE-Curative Actions

- After the ice has melted, do corrective pruning of broken branches if it is safe to do so from the ground or hire an arborist. Remove branches at branch collar. Stubs should not be left.
- Remove trees that have been uprooted, have trunk failure or more than 50% of branches are broken.
- Avoid fertilization until the plant recovers.
- Keep soils around the plant evenly moist, not soggy or dry.
- Mulch with wood chips to avoid weed competition and to moderate soil temperature and moisture

N EXTENSION

ICE- Curative Actions

- Utilize sand or deicing agents when hard surfaces become unsafe to walk on. Select products that don't harm nearby plant material.
- Do not stand under trees covered with ice. Falling ice is a hazard.
- Avoid walking across ice covered turf.
- Wait for the ice to melt off naturally, do not hit branches to remove ice.

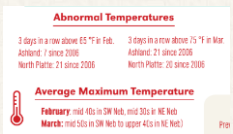
N EXTENSION

DORMANCY BREAKS

N EXTENSION

DORMANCY BREAKS

- When there are warm winter temperatures, plants often break dormancy sooner than they should. They will 'break bud' and begin to grow during the warm temperatures only to have the temperatures drop to seasonal levels soon afterwards. This can cause tissue damage to the newly emerged plant tissue.



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DORMANCY BREAKS- Preventative Actions

- Locations in the landscape might speed up dormancy breaks, like near a brick facade on the south side of a house or plants surrounded by concrete.
- Select plants adapted to USDA hardiness zone 5 in eastern Nebraska; Zone 4 in western Nebraska.
- Watch the weather forecast. Long stretches of unseasonably warm temperatures can cause some plants to break dormancy too soon.

N EXTENSION

DORMANCY BREAKS- Preventative Actions

- Water soils around plants thoroughly in late fall so that they enter winter moist, not soggy or dry.
- Avoid fall fertilization of shrubs, roses, groundcovers and perennials.
- Mulching perennial plant material in the winter (mid to late November) with wood mulch, leaves, or straw will help to protect the plants from the temperature fluctuations and keep a more consistent temperature.

N EXTENSION

DORMANCY BREAKS- Corrective Actions

- Allow frosted leaves and blooms to fall off the plant naturally, then rake them up and compost them.
- Cut off blackened stems
- Avoid fertilization until the plant recovers. Early summer will be appropriate in most situations.
- Keep soils around the plant evenly moist, not soggy or dry.

N EXTENSION

DORMANCY BREAKS- Corrective Actions

- Mulch with wood chips to avoid weed competition and to moderate soil temperature and moisture
- Avoid placement of mulch next to the trunk to prevent suffocation and wildlife damage

N EXTENSION

STORMS

Tornado and Wind

N EXTENSION

STORMS

- Thunderstorms, tornadoes and severe wind storms are a common occurrence on the plains during the warm season.

Average number of days per year this occurs, within a 25 mile radius of any point (1986-2015):

- 57 mph wind or greater: 6-7 days in SE Nebraska and 3-4 days in NW Nebraska
- Any tornado: 1.0 - 1.25 days in SW thru NE Nebraska and 0.50 days in NW Nebraska

Average number of tornadoes per year in Nebraska

- 54 (1985-2014)

N EXTENSION

STORMS- Preventative Actions

- Select and plant trees with dense wood and strong branch angles that are less susceptible to breakage . Consider slower growing trees over very fast growing trees
- Inspect root ball of trees before purchasing. Avoid trees with pot bound roots and encircling or girdling roots.
- Do not allow codominant trunks to develop on shade trees.

N EXTENSION

STORMS- Preventative Actions

- Do not plant too deep. Trunk taper needs to be visible above ground.
- If supports are needed- only for one year low to the ground
- Monitor trees for signs of decay.

STORMS- Preventative Actions

- Prune trees correctly when young so tree develops a strong branching pattern.
- Remove any dead, damaged, or diseased tree branches as you see them at the branch collar. Do not leave stubs.
- Plant trees, shrubs, groundcovers, perennials and ornamental grasses that are adapted to USDA hardiness zone 5 in eastern Nebraska; Zone 4 in western Nebraska.

STORMS- Curative Actions

- Small trees that bent over or leaning may be staked into an upright position. Larger trees may best be removed for safety.
- Avoid fertilization until the plant recovers.
- Keep soils around the plant evenly moist, not soggy or dry.
- Mulch with wood chips to avoid weed competition and to moderate soil temperature and moisture
- It could take several years before some plant species show signs of damage.
- Keep vegetables if the growing point is undamaged
- Remove, replace or re-seed terminally damaged vegetables and bedding plants

STORMS- Curative Actions

- Remove any dead or damaged branches if you can do so safely. Consult an arborist for more extensive pruning or tree removal. Remove branches at branch collar. Stubs should not be left.
- Do not treat wounds with pruning paint or wound dressing.
- Allow leaves and blooms to fall off the plant naturally, then rake them up and compost them.
- Remove trees that have been uprooted, have trunk failure or more than 50% of branches are broken.

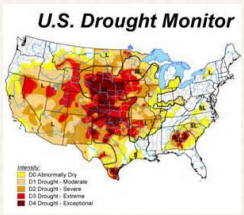
DROUGHT

DROUGHT

- Drought is a deficiency of precipitation over an extended period of time– usually a season or more. From 2000 to 2016, portions of Nebraska had at least "abnormally dry" conditions in 93% of the drought monitor maps and 76% of maps had Nebraska in the "moderate drought" category.

DROUGHT PREDICTIONS FOR NEBRASKA

- Increased drought frequency and severity
- Number of consecutive dry days to increase by 1-3 days
- Decrease in soil moisture of 5 to 10% by 2100



Images: University of Nebraska Lincoln

EXTENSION

DROUGHT- Preventative Actions

- Identify drought prone plants in your landscape. Common specimens in Nebraska are arborvitae, white pine, and turf.
- Mulch with wood chips to avoid weed competition and to moderate soil temperature and moisture
- Water soils around plants thoroughly. Use a soaker hose to apply water slowly and allow it to soak in.

Image: Platte County Extension, MAdamy

EXTENSION

DROUGHT- Preventative Actions

- Plant well-adapted plant material
- Group plants by water, light and care needs
- Promote dense turfgrass stands
- Audit irrigation systems for proper water placement
- Proper mulching and maintenance around plant material
- Provide adequate fertility needs – no overkill!
- Meet irrigation needs of plant categories

EXTENSION

DROUGHT- Preventative Actions

- Cluster plant material with similar water requirements together.
- Evaluate the plants' value in the landscape. Consider watering only the highest landscape value plants if water restrictions are put in place. Trees and shrubs take much longer to establish if lost to drought. Perennials, vegetable gardens, turf are easier to replace if lost to drought.

EXTENSION

DROUGHT- Corrective Actions

- Examine bark, buds, stems to determine if tissues are dried out
- Prune out dead portions of the tree/shrub
- Keep soil moist, not soggy or dry in spring, summer and fall following injury
- Avoid fertilization in first year after drought

EXTENSION

DROUGHT- Corrective Actions

- Mulch with wood chips to avoid weed competition and to moderate soil temperature and moisture
- Avoid placement of mulch next to the trunk to prevent suffocation and critter damage
- Droughts' impacts on some trees might not be fully recognized for a few years following drought.
- Lawns that didn't receive enough moisture to keep the crowns alive should be overseeded to reestablish turf.

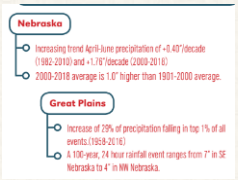
EXTENSION

FLOOD

N EXTENSION

FLOOD

- Extremes in rain events increases the chance of localized flooding like in low-lying areas and streets, as well as more devastating events like river flooding.



N EXTENSION

FLOOD- Preventative Actions

- Pick the right plant for the right place. Select plants that are tolerant to wet sites in areas that have a tendency to remain wet. Avoid planting plants who don't like 'wet feet' in low lying or flood prone areas.
- Remove any dead, damaged, or diseased tree branches as you see them.
- Plant adapted plant material

N EXTENSION

FLOOD- Preventative Actions

- To reduce runoff from landscapes during heavy rain events, slow it down and soak it in with landscape features such as rain gardens, bioswales, & low berms that direct rainwater where it is wanted or will reduce flooding risk
- Encourage rainwater to soak in rather than run-off with good soil management - increasing organic matter content of soils/reducing soil compaction, such as will core aeration or tillage where feasible.

N EXTENSION

FLOOD DAMAGE

- Plant roots need air (oxygen) just as much as they need water. When the pore space between the soil particles is filled with water for extended periods of time, plants will become stressed and start showing symptoms of too much water like yellowing of the leaves with a drooping appearance.

N EXTENSION

FLOOD- Corrective Action

- Remove and dispose of all garden produce that has come into contact with flood waters. It is unknown what the water contained, and the produce should be considered contaminated.
- Remove any dead or damaged branches if you can do so safely. Consult an arborist for more extensive pruning or tree removal.
- Watch for secondary pest problems like insects or fungi on stressed plant material.
- Keep soils around the plant evenly moist, not soggy or dry.

N EXTENSION

FLOOD- Corrective Action

- Mulch with wood chips to avoid weed competition and to moderate soil temperature and moisture.
- Avoid fertilization until the plant recovers.
- Little is known about the long-term effects of flood on plant material. Realize that it could take several years before some plant species show signs of damage.
- Pull back mulch after flooding or extreme precipitation events to speed soil drying if saturated; then replace mulch.

N EXTENSION

HAIL

N EXTENSION

HAIL

- The frequency of hail in the U.S. is greatest in the Great Plains due to a higher elevation (closer to freezing level). Hail forms when rain/ice particles are carried in the updrafts and downdrafts in thunderstorms colliding and freezing onto one another, while growing into larger pieces of ice.

An average of 70% of hail reports in Nebraska occur from May-July (1955-2015).

From 2000-2012, there were 7-11 severe hail days (>1.0" hail within 25 miles of any point) per year in Nebraska.

Number of days per year, within 25 miles of any point from 1986-2015:

Hail > 1.0"	Hail > 2.0"
S Neb 5+ days	S Neb 1 day
N Neb 3-4 days	N Neb 0.6 days

Source: Storm Prediction Center

N EXTENSION

HAIL- Preventative Actions

- Remove any dead, damage or diseases tree branches as you see them.
- Bring potted plants and trees to a temporary protected location or cover plant material with large empty pots or empty containers until the threat of hail has passed.
- Hoops with floating row cover can help prevent hail damage to vegetable crops.

N EXTENSION

HAIL DAMAGE

- Impact from hailstones can damage leaves, stems and fruit. The size of the hailstone, the amount of hail, time of year, and the wind speed plays a big role in the amount of damage to plant material.

N EXTENSION

HAIL- Corrective Action

- Utilize corrective pruning of broken branches if it is safe to do so from the ground or hire an arborist.
- Cut off severely damaged flowers and stems with a by-pass hand pruner just above a node

N EXTENSION

HAIL- Corrective Action

- Replant annual flowers that do not have any remaining foliage or show signs of recovery within a week.
- Avoid fertilization until the plant recovers.
- Keep soils around the plant evenly moist, not soggy or dry.
- Mulch with wood chips to avoid weed competition and to moderate soil temperature and moisture
- Monitor plants for signs of cankers on twigs/branches; prune these out

N EXTENSION

FROST

N EXTENSION

FROST FREE SEASON PREDICTIONS

- Frost-free season has increased by 1-2 weeks since 1991 in Great Plains
  - On average, by one week statewide in Nebraska
  - By 5 – 25 days since 1895
- Expected to increase in future decades
  - Additional two weeks

Image: University of Nebraska Lincoln

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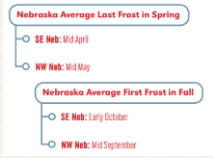
FROST

- Frost is what happens when ice crystals form on the surface. (or a layer of ice that forms on surfaces that are at or below 32°F) - The ground, or any surface, must be at or below 32 and match the dewpoint for frost to form - cold air sinks, so surface may be cooler than air above it - calm, clear nights enhance frost chances.



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FROST- Preventative Actions

- Plant trees, shrubs, groundcovers, perennials and ornamental grasses that are adapted to USDA hardiness zone 5 in eastern Nebraska; Zone 4 in western Nebraska.
- Pay attention to the weather forecast; nights without cloud cover typically cause the most damage.
- Water soils around plants thoroughly in late fall so that they enter winter moist, not soggy or dry.

N EXTENSION

FROST- Preventative Actions

- Cover susceptible low growing plants in the evening with sheets, tarps or blankets. Use a stake or frame to minimize contact between the cover and the foliage. Remove the covering from in-ground plants when temperatures warm in the morning.
- Bring potted plants and trees to a temporary protected location until temperatures warm to 50 degrees or above.
- Avoid fall fertilization of shrubs, roses, groundcovers and perennials.

N EXTENSION

FROST- Preventative Action

- Move frost tender plants inside
- Lay plastic layers or row cover fabrics over crops
- Install floating row covers
- Re-establish mulch around crown of plants
- Avoid pruning back damaged material right away
- Replace tender vegetable and bedding plants
- Plant another rotation of vegetables if soil temperature is too cold.

FROST- Corrective Action

- Allow frosted leaves to fall off the plant naturally, then rake them up and compost them.
- Cut off blackened stems with a by-pass hand pruner just above a node Avoid fertilization until the plant recovers. Early summer will be appropriate in most situations.
- Keep soils around the plant evenly moist, not soggy or dry.

Final Thoughts

SUMMARY

- Weather variability will not go away.
- Poor plant selection and placement is expensive time, money, and resource wise.
- Increased maintenance and chemical input will be used with poor selection and planning.
- Work with what you have and make changes along the way.

SUMMARY

- Utilize microclimates, slope, wind patterns, exposures
- Locally adapted plant material
- Right plant-right place followed
- Proper mulching practices
- Reduction of narrow turfgrass areas
- Biodiversity of a mix of different species

Questions?

- Contact Info

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